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THE ROSE TECHNIC

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Make-up .... Ted Blickwedel, William R. McGlone
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Electrical Engineering In The Post War World

by Brice Rumble, soph., e.e.

The author, a student of electrical engineering, believes that this particular branch of engineering offers great opportunities in the post war world. He expresses the belief that the greatest advances will be made in electronics, frequency modulation, and television. He also suggests that electrical equipment, because of its superior quality, will be one of our greatest bargaining agents in foreign markets. Whether the reader agrees with Mr. Rumble's views or not, he will find this article both interesting and informative.

The entire field of engineering offers many opportunities in many different types of work, but probably no other field offers such a wide variety as that of electrical engineering. A young man may have all the necessary qualities essential to becoming a good engineer and yet may not have the type of mind essential to the practice of electrical engineering on its technical side. This is due to the difficulties in visualizing in practical form the results of electrical theory and requires a special quality of the mind and imagination. The mind should be of a type which is capable of grasping and holding analytical theory. Anyone having a strong conservative tendency is at a disadvantage in electrical engineering.

The everyday consumer of electricity knows very little about it. For all practical purposes all they know is that they push a button and the light goes on. Some few years ago electricity and electrical devices were causing a sensation similar to that of atomic energy today. Because electricity was something new it was then catching the fickle eye of the public and everyone was trying to find out just what it was. This was all good and well for this general interest aided directly and indirectly in the rapid advances in theory and practice which took place in electrical engineering.

Far be it from me to say that I am capable of looking into the future and telling the public just what will happen in electrical engineering because today it is becoming increasingly difficult to distinguish between the possible and the impossible. To illustrate what I mean I might say with all feelings of conservativeness that atomic energy for the general public will someday be a reality, but who could say when or upon what date.

Maybe our technical knowledge has grown too fast for us. At any rate many supposedly learned people believe so. They fear that the people of the world will eventually destroy themselves with weapons that engineers and scientists evolved in the laboratory and drafting room. However it is not the aim of engineering and science to destroy the world but rather to make the world a better and finer place in which to live. I cannot think of any article of warfare that would not serve as equally a great role in peace. So rather than say that science is developing too fast I would rather say that progress in the field of human relations is developing too slow, and this is certainly not the fault of the engineer. So in the future we must make use of our marvelous new developments in the right direction.

The very mention of the word electronics opens up a discussion among engineers as to its place in the future. There is still a great amount of mystery about electronics among electrical men, and its place in the post war world is not a secret solely because of military authority. The field of electronics is still in its infancy and the engineers and researchers are not making their discoveries known to everybody in general. No one would put in the newspapers that they had discovered a gold mine at a certain place before they had first made themselves sure of the rights to the gold.

The place of electronics in the post war world will depend upon many factors, the main factor being that of economics and this will probably determine the rate of its expansion and growth. Another factor of great importance will be its ability to do jobs better than they may be done by any other means.

There is no definite definition of the word electronics. To engineers it means "the practical use of the flow of electrons through space." Obviously we cannot cover the entire history of electronics here but starting in about 1900 experimenters turned their attention to electronics on a large scale and the war has hastened this development till today it is an industry.

Radio has been and probably always will be the greatest field of electronics. A newer application of electronics which promises to be of great importance in the future is that of television.

In our consideration of the place of radio and television in the future let us first examine the advances in the field which took place during the war. As a result of the stimulus of war certain services now use frequencies as high as 1000 megacycles. This means that the frequency ratio has grown by a factor of 30.

World War II has also seen the growth of another use of electronics which contributed greatly in our victory — namely radar. Only re-

(*Continued on Page* 18)

Anhydrous Hydrofluoric Acid

by Robert Bannister, soph., ch.e.

Anhydrous hydrofluoric acid, which was practically a laboratory curiosity until recent years, is being used in ever increasing amounts. This is due, largely, to the development of Freon refrigerants. Today, however, its most important use is probably as a catalyst in many important organic reactions. Mr. Bannister in this article discusses the industrial process for AHF, the difficulties connected with its handling, and its uses.

Until 1931 anhydrous hydrofluoric acid, abbreviated AHF, was practically a laboratory curiosity. The development of the Freon refrigerants was the stimulus which led to the development of an industrial process for AHF in that year, since the anhydrous acid is a necessary raw material in the synthesis of Freons. More recently it has been discovered that AHF is a useful catalyst for many organic chemical reactions. Its greatest use today is as a catalyst in producing high quality aviation gasoline. It is also used in the production of a few chemicals and for undisclosed military purposes.

Hydrogen fluoride in its anhydrous form was first prepared by Sir Humphry Davy in 1813 by the electrolysis of aqueous HF until the solution would no longer conduct the electric current. Later the material was prepared by heating pure, dry potassium hydrogen fluoride. These painstaking processes are necessary because ordinary methods do not suffice to remove water from concentrated HF solutions. Concentrated sulfuric acid, a well-known dehydrating agent, reacts to form fluorosulfuric acid, while calcium chloride reacts to liberate hydrogen chloride. Similar reactions occur with other common dehydrating agents.

The Industrial Process for AHF

In the industrial process hydrofluoric acid is produced by the reaction between fluorspar (calcium fluoride, CaF_2) and sulfuric acid, followed by a distillation process which removes practically all the water. The fluorspar used contains less than 1% silica so that only a minimum amount of hydrofluosilicic acid will be formed. The spar and concentrated (99%) sulfuric acid are fed into a still heated by a furnace and react according to the equation:

$$CaF_2 + H_2SO_4 = CaSO_4 + 2HF$$

When a slight excess of sulfuric acid is used, the unreacted spar can be kept to less than 1%. Recently the process has been made continuous, so that spar and acid are added continuously while $CaSO_4$ residue is constantly removed. This makes possible a more uniform evolution of HF and better absorption yields.

The gas comes from the still at a temperature of 250° to 350° F and consists of about 75% HF. After the spar carryover is removed in a dust collector, the gas is scrubbed countercurrently with condensed sulfuric acid to remove residual sulfuric acid entrained in the gas. Following this the gas is passed through a series of absorption towers. Water is sprayed down through the last tower countercurrent to the flow of HF gas and removed from the bottom as approximately 10% acid; it is then pumped successively back through the series towards the first tower, constantly gaining in acid strength. The acid removed from the bottom of the first tower is approximately 80% HF. The weak acid is cooled in water-sprayed coils before being passed into each tower except the first; before being passed into the first tower it is refrigerated to 20° to 40°F by an ammonia system. With the use of cooling, absorption of HF gas is nearly complete.

Distillation is utilized to concentrate the 80% acid to the anhydrous form. The operation is carried out at about 240°F. At this temperature 40-41% HF (a constant boiling mixture) collects at the bottom while AHF (boiling point: 67°F) is removed at the top. The AHF is condensed and stored, while the 40% acid is either fortified in the absorption process back up to 80% for redistillation or used in the production of other chemicals. The commercial AHF produced contains less than 0.5% water, usually about 0.1%. Small amounts of silicon fluoride and sulfur dioxide may also be present. About 25,000 tons of AHF were produced in 1944. The commercial product is available in large quantities for about 20 cents a pound.

Handling AHF

AHF differs greatly from aqueous HF in its corrosive effects. Steel, for instance, has been found to be one of the best metals for use with AHF, while HF solutions below concentrations of about 60% have a high corrosive effect on steel. Experiments show that the best type of steel for this use contains as little non-metallic impurity as possible. Cast iron, therefore, is not suitable for handling AHF. The inactivity of AHF with steel is apparently due to the formation of a coating on the surface of the metal which prevents further reaction because of its insolubility in the acid. Steel valves in AHF pipe lines must be opened and shut very frequently in order that "freezing" will not result from the cementing action of this film.

Copper, silver, platinum, and Monel metal (a nickel-copper alloy) all possess even greater resistance to AHF than steel. High cost or lack of priorities has prevented theii use in this field except in laboratory equipment. In addition, copper is unsatisfactory when sulfur dioxide and oxygen are present, while silver is similarly unsuitable in the presence of sulfides or sulfuric acid. Lead is unsatisfactory for use when the acid concentration is above 65%. Other materials attacked by AHF include wood, rubber, most plastics, and ordinary glass. However, a new type of glass with a base of phosphorus pentoxide instead of silica resists HF of all concentrations.

AHF is a serious hazard to safety when proper precautions are not taken. It attacks flesh rapidly, producing deep and slow-healing burns. The acid continues to destroy tissue until it is removed by flushing the skin with large quantities of water. Pain is not necessarily experienced immediately on contact with the acid. HF fumes also cause trouble by producing throat and lung irritations when inhaled. By the use of protective clothing, including gloves, goggles, and head coverings, it is possible to minimize both the seriousness and prevalence of injuries in industrial plants. Careful upkeep of equipment is also a prime factor from the standpoint of safety.

Uses of AHF

The manufacture of Freons still consumes a large part of AHF production. The principal member of this family is Freon-12, chemically known as difluorodichloromethane, CCl_2F_2. This substance is manufactured commercially from carbon tetrachloride and AHF, which react according to the equation,

$$CCl_4 + 2HF = CCl_2F_2 + 2HCl$$

The process is carried out under a pressure of about 60 pounds per square inch and employs antimony fluoride or chloride as catalyst. Yields up to 90% or even higher are obtained. Freon-12 finds its main use as a refrigerant, although recently it has been widely used as the propellant in aerosol insecticide bombs.

The largest single user of AHF is now the petroleum industry. The anhydrous acid has been found to possess valuable catalyzing properties for the production of high-octane gasoline, and the development of this process has been especially important from the military point of view. The reaction utilized by the process is the alkylation of isobutane with butylene and other olefins as represented by the equation,

$$C_4H_8 + i\text{-}C_4H_{10} = C_8H_{18}.$$

The product of this reaction is a highly branched isoparaffin which gives a high performance rating as a fuel. Although other catalysts are capable of promoting this reaction, the trend seems to be toward the use of AHF.

The controlling factor in the commercial alkylation process is the availability of butylene and other olefins, since they are much scarcer than the relatively plentiful isobutane. The usual raw material is a refinery butane-butylene fraction containing both reactants, although sometimes propylene and amylene are also used when available. The properly blended raw materials are passed through a bauxite drier to

(*Continued on Page* 20)

A Phillips HF Alkylation plant. *Phillips Petroleum Company*

The Iron Ore Supply

by William K. Sharpe, fresh.

Iron and steel have long been recognized as important factors in our national economy. While our potential supply of iron is tremendous, our existing supply may last only ten to forty years longer. Our greatest ore mining center at the present is the Mesabi area of Minnesota. Mr. Sharpe discusses in detail this great ore deposit as well as other U. S. and foreign reserves.

Iron ore is one of the basic materials for the application of the scientific advances of the world. Iron is one of the commonest elements of which the earth is made. However, pure iron is scarcer than gold or diamonds in nature, and is rarely found in a free state except as meteorites. It is believed that the core of the earth is nearly pure iron for a radius of two thousand miles. This, of course, is of little value as a source of iron.

Throughout the world there is a tremendous total tonnage of iron compounds, but in few places are these materials concentrated sufficiently to constitute an ore under present standards. Of course, these ore standards would change with new developments, and with the present apparently rapid rate of progress this is not highly improbable. At present, however, it is estimated that good ore will last only from ten to forty years even under normal conditions.

Iron formations are now considered ores if they contain 35 to 70 percent iron. Ores of less concentration may be considered if they contain certain impurities. Ores from the Minnesota range have contained 51.5 percent iron or better consistently over the years. As a result, blast furnaces in the Great Lakes area have been designed so as to receive this particular ore. Furnaces serving other areas are also designed with this end in view.

As implied above other factors besides the percentage of iron must be considered. The type of mining; open-pit, strip, or shaft; affects the economic feasibility. The geographic position is of great importance. The type of impurities present are important, since certain of these "impurities" may aid the chemical reaction in the blast furnace. Tax laws and politics, unfortunately to science, demand far too much attention.

Westinghouse

A portion of the Oliver Iron Mining Co. operation in the big pit near Hibbings, Minn.

Practically speaking, iron is mined as only three different oxides of iron in the United States: hematite, magnetite, and limonite. Most iron is mined as hematite (Fe_2O_3) which is 70 percent iron. This ore accounts for 90 percent of the ore mined in America. Magnetite (Fe_3O_4) contains 72.4 percent iron. This material has a definite attribute in that it may be concentrated by magnetic means. Limonite ($2Fe_2O_3$-$3H_2O$), hematite combined with water, contains 59.8 percent iron. Iron carbonate, siderite, is of relatively little importance, while pyrite (FeS_2) is a source of by-product iron ore after roasting to recover sulfur.

Silica is the most abundant impurity of iron ore. In the blast furnace it acts as an acid; therefore it must be fluxed by a base, such as limestone, to produce slag. Of course, limestone as an impurity is considered advantageous since the ore is self-fluxing to some extent.

United States is the world's leading producer of iron ore. Of the 136 million gross tons annual average production, United States mines 42 million gross tons; and of the 194,000 million metric tons of actual and potential reserves, United States possesses 71,000 million metric tons. America is extremely fortunate in this respect. The early surveyors of Michigan and Minnesota were ignorant of the significance of the fact that their compasses failed to function correctly. The Canadian-U. S. boundary of the Treaty of Paris in 1793 was poorly defined. In 1794 John Jay, Secretary of

Existing and Potential

State, attempted to set a boundary that would have given England the great Mesabi area; however the English refused his offer. The issue was eventually settled by the Webster-Ashburton treaty of 1842 which purely by luck gave us the Mesabi area. The Mesabi pits have since become the leading United States and world iron ore mining center. It produces 57 percent of the American total, exceeds all other areas in total past tonnage, and all other areas in known reserves.

The Mesabi, meaning giant, takes its name from a low range of hills nearby. The iron "range" is a narrow strip of one to three miles wide and one hundred miles long. The iron deposits are believed to have originally been in the form of carbonates. The oxygen from the ground water oozed through the rocks to break up the iron carbonate into iron oxide and carbonic acid. This resulting carbonic acid enabled the water to dissolve crystalline silica or quartz. In this way nature did part of the iron concentration, called beneficiation. The moraine left by the glaciers apparently stopped this process before it was completed.

The pits are several hundred yards to a mile or more wide and are much longer. The Hull-Rust-Mahoning pit at Hibbing, Minnesota, produced 21 million tons of ore in 1941, and since 1896 it has produced a total of 375 million tons. The average content of this ore is 52.0 percent iron, 11 percent free moisture, 8 percent silica, .062 percent phosphorus, .68 percent manganese, and a negligible amount of titanium and sulfur. Ore is removed from these pits by power shovels and moved out of the pits to the railroads by trucks, locomotives, or belt conveyors. It is then moved to the ore docks on Lake Superior by railroad.

In the Mesabi as in the rest of

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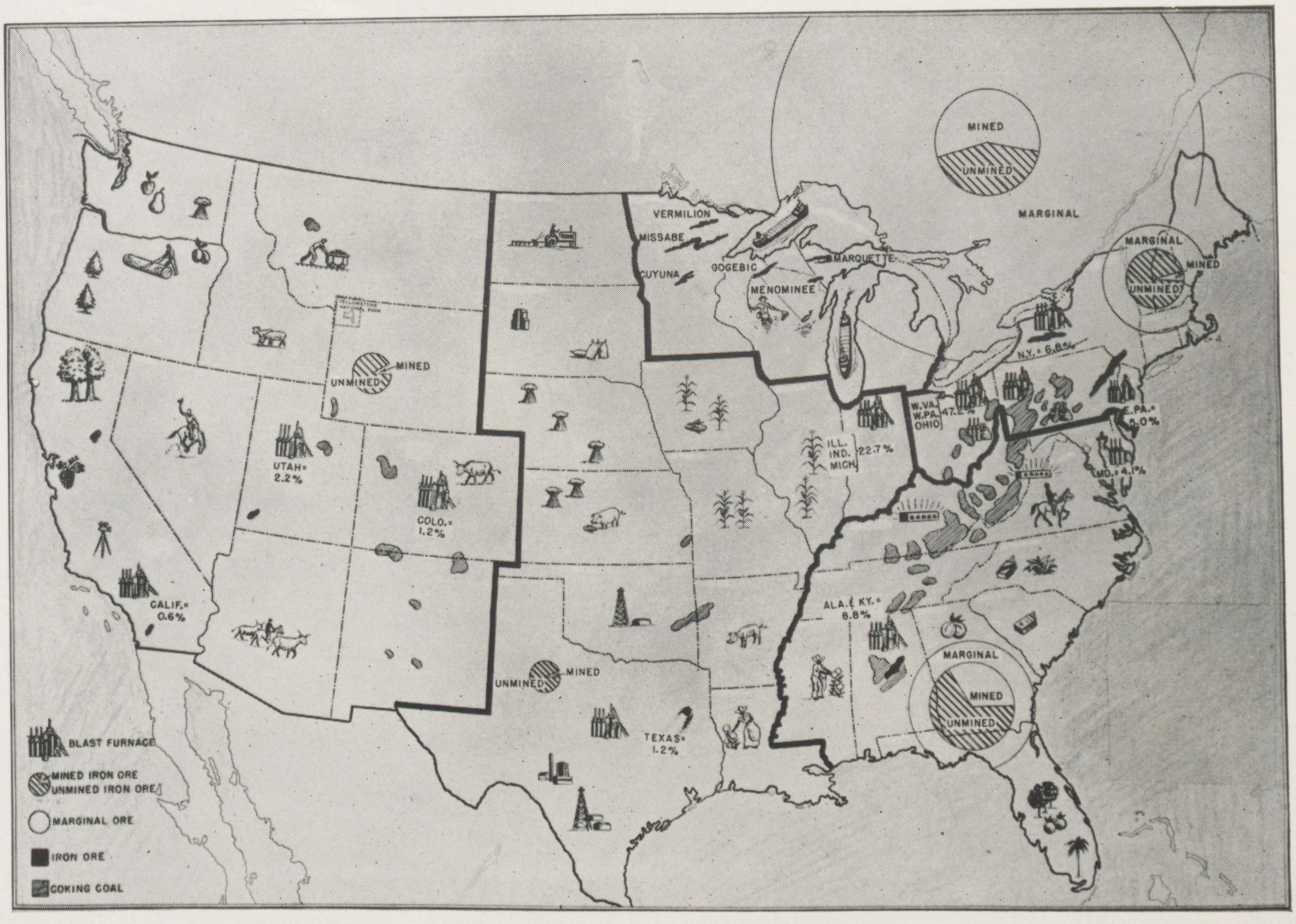


This map gives an idea of the principal areas now producing iron ore, the coking-coal regions, and the concentrations of blast-furnace capacity as percentages of the U. S. total. Circles indicate quantities by regions of mined and unmined ore now considered commercial and rough estimates of marginal ore (data by E. W. Pehrson, U. S. Bureau of Mines). The amount of marginal ore in the Central and Western regions is thought to be small.

Basic U. S. Inventions

Reprinted from
ALLIS-CHALMERS ELECTRICAL REVIEW

by Miles Henninger, patent att'y, Allis Chalmers Mfg. Co.

Inventions—as protected by the United States patent system—are a definite part of the foundation of American progress and prosperity. They represent the highest expression of our mechanical genius for doing things better. And in the years to come, inventions will continue to result in higher standards of living, greater ease and comfort, lower living costs, and a fuller use of our natural resources for the good of all.

The following stories of truly great inventors and their basic inventions were first printed in the Allis-Chalmers Electrical Review and then appeared in booklet form. They are reprinted here as a continuation of the policy of printing an article by an industrial writer each month.

Morse's Telegraph 1840

Samuel F. B. Morse was born in 1791 at Charlestown, Mass. In 1810 he was graduated from Yale, where he studied and taught the sciences, particularly electricity. However, he wanted to become a painter, so he went to London to work under Benjamin West. For 17 years after his return to the United States, Morse painted portraits, gaining the most success in Charlestown, S. C. Morse's competence as a painter earned him the presidency (1826 to 1842) of the National Academy of Design, and a professorship in the arts of design at New York University. In 1829 Morse went to Europe to visit art galleries and further study painting.

While Morse was in Europe, the electrical discoveries of the time were just coming to general attention and they were being widely discussed. The systems of rapid communication in Europe at that time included the French semaphore devised by the Chappe brothers, the German electromagnetic telegraph by Steinheil, and the English electroneedle telegraph invented by Wheatstone. The semaphore system required towers and operators in sight of each other, and its capacity never exceeded 100 words per hour. The German system had two permanent magnets with recording pens, acted upon by a coil, and was capable of sending 360 words per hour. The English system employed one or more magnetic needles movable over a dial bearing letters and numbers and operated at about the same speed as the German system.

In discussing the recent electrical discoveries while returning from England, Morse conceived the idea that electricity could be used more directly and more rapidly for sending messages. He was so enthusiastic about his idea that he lived and worked in a single room for five years while completing his first

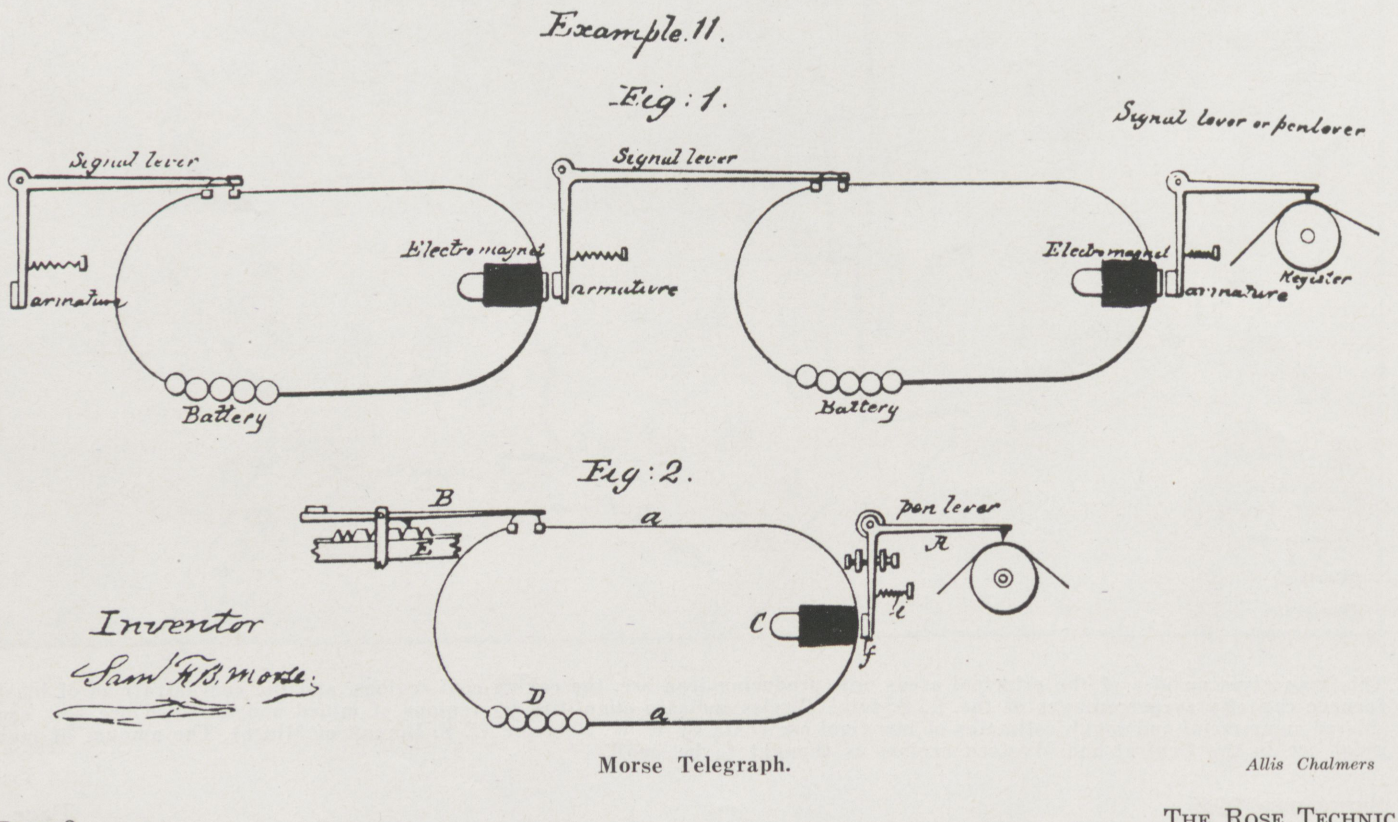
S. F. B. MORSE.

Telegraph Signs.

4 Sheets—Sheet 4.

No. 1,647.

Patented June 20, 1840



Morse Telegraph.

Allis Chalmers

model, besides teaching design at New York University. He had to make his own electromagnets, had to invent a relay to overcome the voltage drop in the line so as not to go beyond "the limit of the magnetic power," and he even had to insulate his own wire!

After finishing the first model, Morse realized he needed help, so in 1837 he formed a partnership with Professor Leonard D. Gayle of New York University for technical advice and with Alfred Vail for financial aid and experimental assistance. By 1838, messages were sent by a dot-dash code, using a printing type sender, at the rate of 600 words per hour.

Morse asked Congress for $30,000 with which to build an experimental line from Baltimore to Washington but he was refused the money. He went to London and to Paris but could not interest any European government in his telegraph. When he returned, he was without money or even resources for food, because his clients for portraits were all gone. For the next four years, Morse unsuccessfully importuned Congress for funds, but he also improved his batteries as a source of current and developed the sending and receiving key to a point where 20 to 30 words per minute could be sent. He also prosecuted his patent application, which became patent 1,647, issued June 20, 1840. It covers both the printing type and the key means for sending and receiving messages.

Congress granted Morse funds in 1843, and he began to build his experimental line, which had a conductor wrapped in cloth soaked in beeswax and tar for insulation. It was placed underground in lead pipe. Twenty thousand dollars was spent for ten miles of line which was a failure when tested. The remaining $10,000 was used to build a line of conductors mounted on door knobs as insulators on the cross arms of short poles. This line, when tested in 1844, proved to be entirely successful.

Morse, however, was refused a British patent because of a description published by Ed. Davy in the London *Mechanics Magàzine*, January 20, 1838. And his French patent was forfeited because the telegraph was not put into public use within the French time limit.

Morse next offered his invention to the United States government for $100,000, but the offer was refused. Private capital then took up the telegraph, and many unprofitable small companies were organized. When these were consolidated in 1857 as Western Union, it was said to have been "like collecting all the paupers in the state and arranging them into a union to make rich men of them." But two years after the first telegraph line was built, receipts for the first quarter were only $203.43, although the rate was just one cent for each four characters. By 1853, however, there were 4,500 miles of telegraph lines in the United States, and Morse then had to defend his inventorship against others (14 L. E. 601).

The telegraph replaced the pony express in 1862 and was the basis for the Atlantic cable in 1866. Morse became a wealthy man. He received many decorations, medals, and orders and, in 1858, received a gift of $80,000 from several European nations at the urging of Napoleon III.

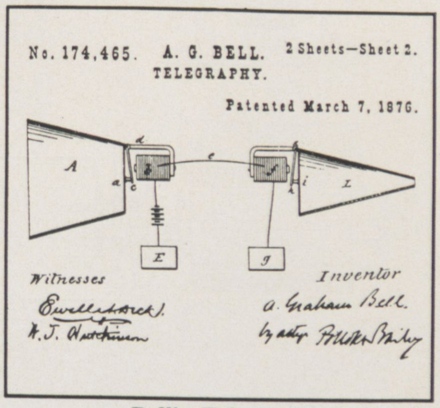
Bell's Telephone 1876

The telephone was invented in the United States and as the result of encouragement given by United States citizens, but its inventor, Alexander Graham Bell, was born (1847) in Edinburgh, Scotland. Bell attended the University of Edinburgh and the University of London, where he was trained in elocution and music, which taught him how sounds are produced. As a boy he made a model of the human head and larynx to study speech. While studying elocution with his father, he came upon Helmholtz's working in transmitting sounds electricially by means of tuning forks set in vibration.

Bell taught at the Boston School for the Deaf, where in 1871 he developed a device which he called the "phono-autograph." It recorded sounds as lines on a smoked glass and was simply a cone with a flexible membrane mounted in the small end, and a lightweight lever moved a pig-bristle point bearing on the glass. He next tried a human ear for making his tracings. From the action of the ear, Bell conceived the idea that vibrations strong enough to move the chain of ear bones might be used to vary the current flow in an electric circuit, which would reproduce the vibrations at a distance. Bell succeeded in interesting Thomas Sanders and Gardner Hubbard (the fathers of two of his deaf pupils) in his idea, and they financed his experiments for several years, while Professor Joseph Henry encouraged him to do the necessary study and work.

A sound recorder is described by French patent 124,213 to Charles Cros in 1877, and a machine for reproducing sound is shown in French patent 17,898 to Leon Scott in 1857; but the first successful transmission of speech came in 1874 only after many unsuccessful trials of different devices. Patent No. 174,465 was granted March 7, 1876 on the device which Bell found successful.

The telephone was exhibited at the Centennial Exposition in Philadelphia, but was completely ignored until noticed by Dom Pedro, then Emperor of Brazil, who tested the telephone and exclaimed, "It talks." This brought the telephone to the attention of the exhibit judges and all of the electrical men present. Even so, the telephone came into public use very slowly, and its chief use was burglar and fire alarm con-

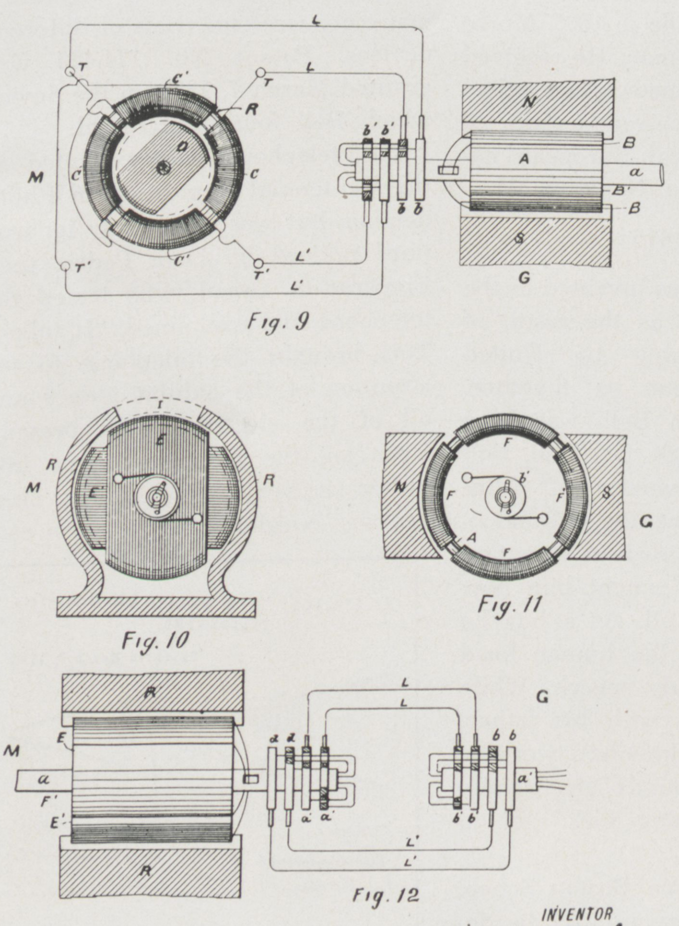


Bell's Telephone

nections from stores to public stations and fire houses. The first telephone exchange was established in Boston in 1877 with five banks for customers. By 1896, the ten-party line could be had for $1.50 per month, and telephone service was established.

By August, 1877, a total of 778 telephones were in use, and the demand exceeded manufacturing facilities. But the Bell Telephone association was in financial distress, and the invention was offered to Western Union for $100,000. The offer was refused. Later, Western and others brought forth other claimants to the invention (31 L. E. 863 and 35 F 735) but lost the battle. Bell Telephone stock then rose to $1,000 per share, resulting in the formation of the A. T. & T. Co. in 1885. All original promoters, including Bell, made comfortable fortunes.

N. TESLA.
ELECTRICAL TRANSMISSION OF POWER.
No. 382,280. Patented May 1, 1888.



Tesla's Motor.

Tesla's Induction Motor 1888

Nikola Tesla, the son of a Greek Catholic clergyman, was born (1857) at Smiljan Lika, Croatia (Austria-Hungary). It is said that Tesla's father intended him to be a clergyman but promised to allow him to study engineering only when his son was on his supposed death bed from cholera. Tesla was sent to Joanneum, a polytechnic school in Gratz, and to the University in Prague for two years. He started in the engineering department of the Austrian telegraph system, and then became an electrical engineer at an electric power company in Budapest and later in Strassbourg.

While in technical school, Tesla became convinced that commutators were unnecessary on motors; and while with the power company he built a crude motor which demonstrated the truth of his theory. In 1884, Tesla came to the United States and joined the Edison Machine Works as a dynamo designer. There he saw Edison's research laboratory, and he learned about Edison's methods and frequently violently disagreed with them.

Up to 1887, no practical small a-c motor was available (110 F 753), and factories were dark, dirty, and hazardous places with line shafting and belts to power individual machines. Power transmission was very inefficient, because 30 to 60 percent of the energy was wasted in turning the shafting, and power distribution was so inelastic that effective arrangement of the machinery was impossible. Ferrari, in a lecture published in Milan in April, 1888, is said to have described an induction motor; and French patent 190,946 to Borel discloses an electric meter also usable as an induction motor. A Westinghouse engineer, Shallenberger, independently invented polyphase and splitphase induction motors shortly after Tesla had completed his work on them.

In 1887 and 1888 Tesla had an experimental shop at 89 Liberty Street, New York, and there he invented the induction motor (patent 382,280, issued May 1, 1888). This machine had a rotating magnetic field which eliminated the need for a commutator; it made unit drives for machines feasible and also made a-c power transmission an economic necessity. The experimental shop was moved to South Fifth Avenue, where all of Tesla's original models were later destroyed by fire.

Tesla tried unsuccessfully to sell his invention to the Mather Electric Co. early in 1888. However, with Brown and Peck, who had aided him financially, he sold the invention to Westinghouse in July, 1888. Tesla spent a year in Pittsburgh instructing Westinghouse engineers, including Shallenberger, who had been detailed to investigate induction motors and who recommended purchase of the Tesla patent. Westinghouse did considerable business in induction motors during the life of the Tesla motor patents and brought a number of infringement suits, and in each case the patents were held valid.

Tesla was given honorary degrees by Yale and Columbia Universities and by Vienna Polytechnic. He was awarded the Edison medal by the AIEE in 1917. The financial return to Tesla is unknown, but despite his 700 inventions he was not wealthy. Much of the time he did not even have a laboratory, and for many years he worked in his room at the Hotel New Yorker. He died January 7, 1943.

(*Continued on Page* 24)

Research and Development

by Charles Hanley, fresh.

High Pressure Wind-Tunnel Speed Turbine Blade Tests

A new type of wind-tunnel tests the blades of turbines many times faster than it is possible with some of the earlier types. The wind-tunnel itself is mastive, and requires a great deal of power to drive it. Because of this, only about a half dozen tests can be made in a year. The wind-tunnel provides information on the aerodynamics of blades under high-gas velocities, and gives the exact, accurate answers needed for final designs. However, because the models are subjected to high velocity, they must be carefully made of steel. Although the tunnel, on the other hand, tries the blades at low speed, but in a medium of high pressure (220 pounds instead of atmospheric), the models can be fashioned of wood. Variations in shape and position can be tried in a few hours instead of weeks.

This type of testing is possible because the air-flow data is acceptably accurate if the pressure is increased as the speed is decreased, in such a ratio that the factor known as the Reynolds number is unchanged. For velocities well below that of sound (i. e. where compressibility is not a factor) the results obtained with the high-pressure tunnel are reasonably accurate, certainly within limits required in the preliminary stages of a blade or nozzle study. This allows a great many variations to be tried quickly, greatly expediting the final designs, which can be tested by the slower, but more precise high-speed tunnel.

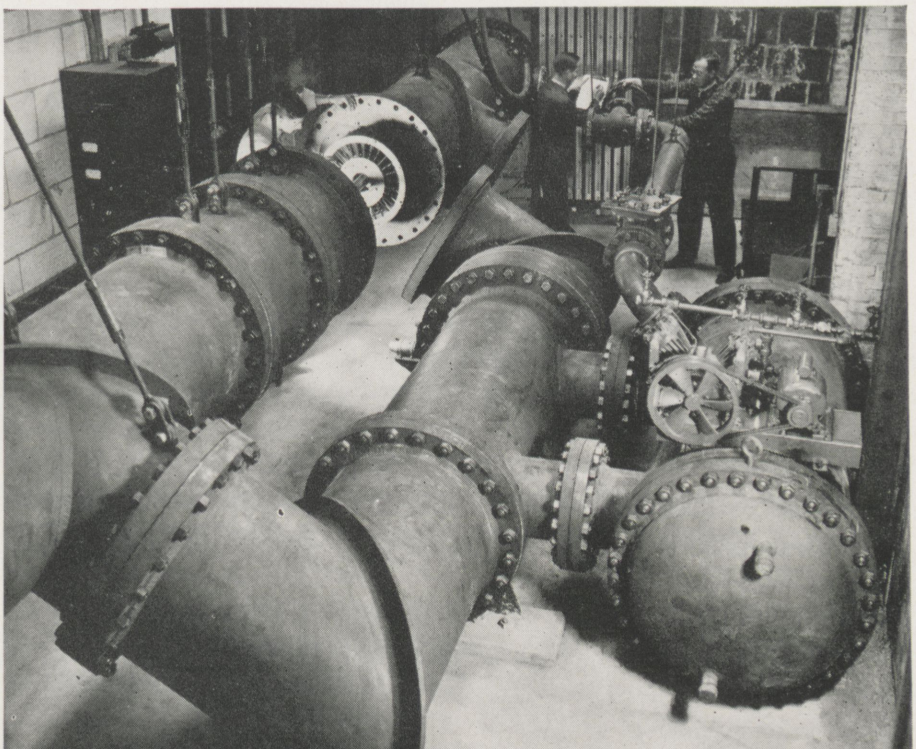
Electrocoating Fabrics

The old high school physics trick of rubbing a glass rod with a piece of silk thereby attracting bits of paper to the rod has given birth to a new business—that of electrocoating fabrics—and in the post war years the design on milady's dress, the upholstering on a chair, and even the nap of a rug on the floor may have been electrocoated rather than woven. This old high school physics trick—that of creating static electricity—has been known to mankind for 2,500 years, but it was not until a few years ago that it was applied in making coated abrasives or sandpaper.

Then followed the question: Why not fabrics? Experimentation with successful results ensued, but the war intervened, and the new wrinkle, as far as large scale production is concerned, was tabled for the duration.

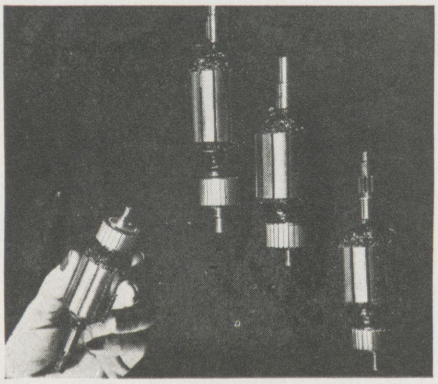
Electrocoating fabrics, or the rod and silk trick "grown up," is a process whereby cloth fibers sent through an electrostatic field become charged, stand on end, and are hurled perpendicularly against an adhesive coated "backing" fabric. The results obtained is either a creation of a new fabric or a design on the original fabric. A high voltage electrical equipment is set up to produce the Electrostatic field. Loose fibers, or flock, when conveyed on a belt through the electrostatic field, receive a charge of the same polarity as an electrode at the bottom of the field.

Because of the similar polarity, the fibers are repelled upwards with such force that they are hurled perpendicularly into an adhesive-coated "backing" fabric, which is being run simultaneously through the field. Ends of the fibers are



Westinghouse

High-pressure wind-tunnel and model for testing turbine blades.



Westinghouse

Armatures for high speed tool motors.

buried in the adhesive of the fabric. Final step is conveying the resultant electrocoated fabric through a dryer for "curing." In making designed goods, the pattern is printed with adhesive on the "backing" fabric. When run through the electrostatic field, the fibers cling only where the adhesive design appears. In final form, fibers resemble fine embroidery. Through the electrastatic process, fibers will cling to any kind of adhesive-coated "backing," even paper of the quality of rough newsprint. An entirely synthetic fabric can be created by impelling synthetic fibers upon a sheet of cellophane. As novel as it may seem, the resultant fabric is a tough, densely napped cloth that might be used as a table runner.

A recently conceived application is that of upholstering metal turntables on phonographs. Extremely short fibers can be impelled against leather or leather facsimile so as to create a new kind of suede shoe leather. In like manner, "velvet" lining, for anything from a jewelry box to a casket, can be made. Another electrostatic process is that of the fur coat. One could be made in such a way that the fur would be much more densely napped than that of a hide and in such a way that the wearer need never fear the hair falling out. There is a full field of application that is virtually unexplored as yet, according to engineers. Some of these applications now conceived for post war production are women's dresses and blouses, scarfs, neckties, overcoats, window drapes, curtains, bedspreads, bathmats, hosiery, hats, upholstering for furniture, automobiles and airplanes, and rugs and carpeting. According to the maxim that stamina of any fabric is approximately proportional to its density, the durability of electrocoated fabrics will surpass that of woven goods.

Comparison durability tests on standard textile testing machines show ratios of three to one in favor of electrocoated fabrics.

Longer Life for High Speed Tool Motors

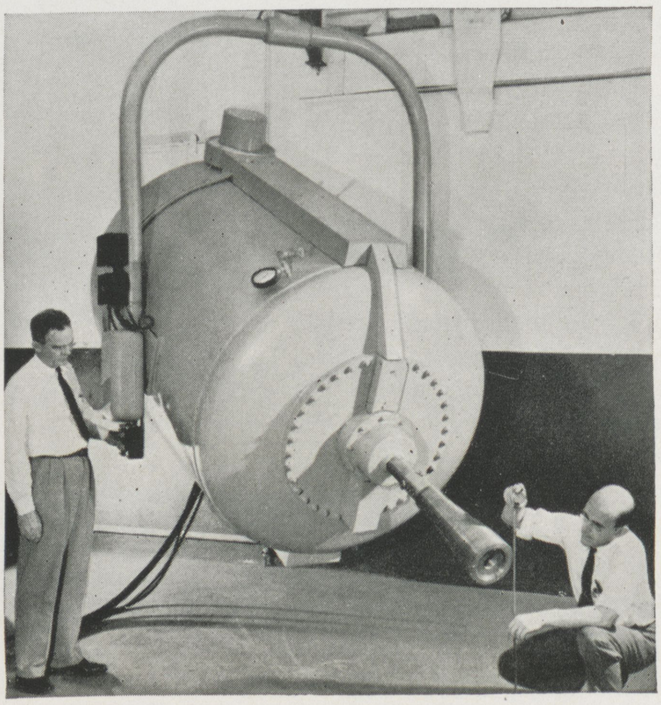
The life of high-speed tool motors has been greatly extended without making any basic changes by re-examination of every tiny detail of their design and construction. High-speed motors that are used for small drills, grinders, routers, and the like are of the universal type and run at 8,000 to 10,000 rpm fully loaded. When the load is removed, the speed jumps to 20,000 rpm, which imposes severe centrifugal stresses on the rotating parts. In such service, motors may last only a few hours or a few hundred hours, depending on the severity of service.

The problem of the high-speed tool-motor designer is like that of the designer of automobiles for racing and is to make a seemingly small change here, a slight modification there, which in the aggregate lead to overall improvement in the strenuous service intended. For example, a thermosetting high-temperature varnish with a durable, moisture-resistant surface has been developed that is extremely resistant to vibration. Although the armature for the high-speed motors are machine wound, each turn of each coil is shaped as it is wound instead of shaping the coil as a group. Assembled commutators are first spun at high speed to disclose any mechanical defects before they are placed on the armature.

Just as many of the lessons learned in racing driving were embodied in the stock cars, so many developments that grew out of attempting to improve high-speed motors have already been applied to the common garden variety of universal motor used in blowers, vacuum cleaners, and many prosaic jobs.

2,000,000-Volt X-Rays

Not long ago we heard and read about the 1,000,000-volt X-rays and how it was used by industry in the examination of heavy metal coatings that went into the war. Now research laboratories have developed the 2,000,000-volt mobile X-ray unit. Thus it becomes practical now for the first time to take pictures through a piece of steel a foot thick.



Westinghouse

2,000,000 volt X-ray.

Such a thickness is opaque to 1,000,000-volt X-rays. In radiographing an 8-inch steel casting, the new outfit is 78 times as fast as the old million-volt unit; and the ratio is even greater for thicker castings. Shown in the picture with the powerful unit are Dr. Ernest Charlton (left), who was in charge of the development, and Willem F. Westendorp, his collaborator.

Network Analyzer

In one of the buildings of a major electric company there is a door labeled "A-C Network Analyzer." This means little or nothing to average passer-by; but to power company men it means the solution of problems too difficult for human calculation, and the saving of thousands of dollars. The analyzer is a cabinet with myriad dials and wires. Designed and built by this company, the a-c network analyzer was put in operation by its engineering divisions seven years ago. Since then utility engineers from nearly every state of the union and several foreign countries have taken advantage of its ability to solve intricate problems. The analyzer bears no physical resemblence whatever to the generating stations, high - voltage transmission lines, transformers or other equipment of the electric power systems that supply energy to factories and homes throughout the nation. Yet the combination of devices known as the a-c network analyzer can be made to behave electrically in the same manner as an actual power system, and in a few hours can perform calculations that ordinarily require weeks or months.

The analyzer became a hero in the early days of the war when power companies found themselves in a tight spot. Despite a tremendously increased load as a result of country-wide industrial expansion and the sudden cancellation of new equipment then on order, the utilities had to turn the wheels of industry faster than ever before.

The analyzer is considered as a proving ground for engineers' ideas, to illustrate: The analyzer predetermines and checks the operation of generating stations and transmission lines before they are built. Circuit breakers, transformers, condensers, generators and regulators are ordered after the analyzer has shown conclusively that the material to be purchased is necessary and of proper design to fulfill all requirements. This predetermination of power-system performance avoids costly mistakes. "Power pools" charted by the a-c network analyzer helped solve the problem. First their operation was studied on the analyzer; then the power systems of various utility companies were interconnected so that any excess generation available on one system could be utilized by the loads on another. Power pools also eliminated the use of precious oil and coal to generate electricity when water power coud be used instead. The analyzer also acted as an infallible arbiter and established beyond dispute the proper operating procedure of the pools. Nearly 300 different investigations have been made on the analyzer by more than 100 domestic power companies and industrial and foreign concerns. New uses for this modern electrical brain are continually being found, such as the solution of problems dealing with fluid flow, a-c machine analysis, electromagnetic fields, elasticity, quantum mechanics and dynamics.

U.S. Tanks Can Shoot On the Run

Much of the success of our tanks against the enemy is attributed to the gyrostabilizer. The 50-pound device permits accurate aiming of high-powered tank rifles despite pitching and jouncing over rough ground.

Soap Coating for Welds

Suitable coatings to prevent the adhesion of weld spatter during the joining of metals not only provide a cleaner finish but also obviate the extra labor ordinarily required to remove the clinging metal particles by chipping or grinding. Several suitable compounds of great value in the war effort are available.

Electrical power system is duplicated on the a-c network analyzer. *General Electric*

Alumni News

by David Templeton, fresh.

The Grads Advance

'06 George F. Nicholson, m.e., is Public Works Officer in charge of construction at Hunters Point Navy Yard, San Francisco, California.

'23 Buford W. Tyler, Jr., c.e., has been made Superintendent of the Pennsylvania Railroad at Erie, Pennsylvania.

ex-30 Barbre has taken a position with Res-N-Cem Company, Inc., at Clinton, Massachusetts. John C. Cooley, c.e., class of '29, is president of the corporation.

In The Service

'32 Joseph L. Hunter, e.e., has been promoted from the rank of Major to Lieutenant Colonel. He has been overseas since January and is with the 643rd Engineer Combat Battalion in Italy. Before going overseas he was on the faculty of the Command and General Staff School at Fort Leavenworth, Kansas.

'43 Feb. Lt. Alan W. Ker, m.e., is the superintendent of a school building in Weinheim, Germany, where nearly 100 men of the 84th Infantry Division attend classes in typing, carpentry, radio, welding, auto mechanics, electricity, and drafting. Lt. Ker supervises lesson planning, keeps attendance records, and does bookwork at the school. Men attending the school are graduated at the second-year college level.

ex-'46 Marion C. Beadling is enrolled in the ASTP at Virginia Polytechnic Institute.

Weddings

Announcement has been made of the forthcoming marriage of Richard C. Milholland, c.e., class of July, '44, to Miss Patricia Cowan, of Terre Haute, Indiana, on Sunday, September 2, 1945.

Births

Lieutenant Colonel Earle H. Butler, class of '35, c.e., with honors, and his wife have announced the birth of a son, John Cody, on July 22, 1945, at St. Anthony's Hospital, Terre Haute, Indiana.

Capt. and Mrs. Norman G. Wittenbrock, class of '38, ch.e., with high honors, has announced the birth of a son, David George, on August 4, 1945.

Mr. and Mrs. James L. Johnston, class of Feb. '43, e.e., have announced the birth of a daughter, Claudia Ann, on August 14, 1945. Mr. and Mrs. Johnston are living at Oak Ridge, Tennessee, where he has been engaged in specialized service for the government stationed at Oak Ridge.

Word has been received of the birth of a boy, Howard Paul, to Mr. and Mrs. Paul Gallatin, class of Feb. '43, e.e., on July 14, 1945.

Deaths

Word has been received of the death of Cpl. Ira B. Scudder, class of Feb. '43, ch.e., on July 21, 1945, in an accident in France. He was a member of the 1035th Engineers, Gas Generating Unit, and had been overseas since December, 1944.

Visitors

'30 John J. O'Mara, A, with high honors.

'31 Allen G. Stimson, m.e., with high honors.

ex-'34 Hartman.

'36 William E. Kasameyer, m.e.

'37 John E. Sonnefield, m.e.

'38 Richard E. Dennis, m.e.

'40 David M. Huggins, m.e.

'42 Martin J. Cavanaugh, ch.e.; Winstont H. Cundiff, ch.e.; Wiliam M. Hochstetler, ch.e., Leon L. O'Dell, ch.e.

ex-'42 Tiefel.

July '44 William R. Colclesser, c.e.; Jay Kress, m.e.; William S. Mitchell, m.e.

ex-'44 Harris, Jones, Blood, Heimroth, Woolsey.

ex-'45 Mitchell, Buescher, Brown, Booth, Fields, Jarrett.

Hermetically Sealed Instruments

To meet the urgent demand of the armed services, a method has been developed for hermetically sealing electric instruments against humidity, water, dust, fungus, discoloration and other adverse conditions, it was announced by engineers. In tests these instruments have been submerged in 60 feet of water for several days, have been suddenly transferred from a temperature of 67 degrees below zero to one of 185 degrees above, subjected to dust storms, all without inflicting any change in their performance.

Experience has shown that in certain climates, especially in the tropics, instruments became corroded, their molded parts swelled and burst, fungus covered the sensitive springs and, in some cases, the pointeds on the instruments fell off. In developing a means for overcoming these conditions, the first hermetical sealing of an instrument containing a moving part, was produced.

To obtain a hermetically sealed enclosure, a thick, special, strain-free glass window is fused to a metal ring in a glass-to-metal seal. This assembly is then fused to a steel case by a soldering joint. Hermetic sealing of the two terminal studs is obtained by glass-to-metal seals between each metal stud and the metal eyelet. This hermetic assembly is sealed to the steel base by a silver-solder operation.

Campus Survey

by Keith Sutton, soph., m.e.

Radio Club

The Rose Radio Club, getting on the beam again after a short lapse due to the war and lack of membership, elected officers at their last meeting. Ted Blickwedel was elected President; Fred Maienschein, vice-President; Brice Rumble, Secretary; and Herb Bailey and Marshall Blanchard, board members.

The club has several new freshman members to bolster the ranks.

Club activities for the term started on Friday, August 17 when two films, "On the Air" and "Electronics at Work", were shown. Demonstration board lectures have been planned and they are to be given by Dr. Howlett.

Also some kits have been purchased and the members are planning to build receiving sets with them.

Since the war is over, the Radio Cub has hopes of being able to broadcast again in the near future.

Camera Club

Thursday afternoons have been set aside by President Joe Durra of the Camera Club for instructing the new Freshman members in the art of developing and printing.

Although the club has been down for quite a while, the addition of new members should help to build it up to its pre-war levels.

Jim Schwier was elected vice-President; Fred Bolle, Secretary-Treasurer; and Walter Glavey, Supply Keeper at a recent election of officrs.

"Rosie"

With many of the new Freshmen having tasted the water of the big lake for disciplinary reasons, the Sophomores finally decided it was time the new first year men should partake in and pay homage to that ancient, rather-beaten, but still victorious symbol of Rose Poly spirit, namely, "Rosie", the elephant.

So "Rosie", all decked out in a new coat of Freshman-applied paint and red numeras, made her appearance in front of the building on Tuesday, August 14.

Yells and songs were the order of the day and the Freshmen gladly obliged.

On Wednesday night, August 22, the same Freshmen again rolled "Rosie" out of her sheltered haven at the back of the building and took her to town. They paraded up and down Wabash Avenue yelling Rose yells and singing Rose songs.

The affair ended up at the Vigo County Fair at Memorial Stadium, where the little men with the green hats, still full of pep, paraded "Rosie" among the exhibits, causing quite a bit of excitement.

Later that night, "Rosie", with a rather broken-down frame, slowly limped, with the help of the Freshmen, back to her resting-place, only a little worse off for the wear.

Modulus

Work has begun on the student yearbook! Yes, the Moduus, after a lapse of a year and a half, is to be printed again in Decembr. It will be the yearbook of the class of December, '45.

The staff is headed by Keith Sutton, Editor; Joe Durra, Business Manager; and Warren Haverkamp, Advertising Manager. Phil Loring and Robert Logsdon are Assistant Editors. Fred Maienschein is Campus Editor.

The assistant Business Manager is Herbert Bailey. Paul Lawrence and Frand Verdeyen will serve as Assistant Advertising Managers.

Steve Liddle heads the circulation Department and Ted Blickwedel will act as Art Editor. The Staff Photographers are Martin Newman and Fred Bolle.

Glee Club

Although the Glee Club has not started practices yet, an organization meeting was held Thursday, August 23 and a good number turned out.

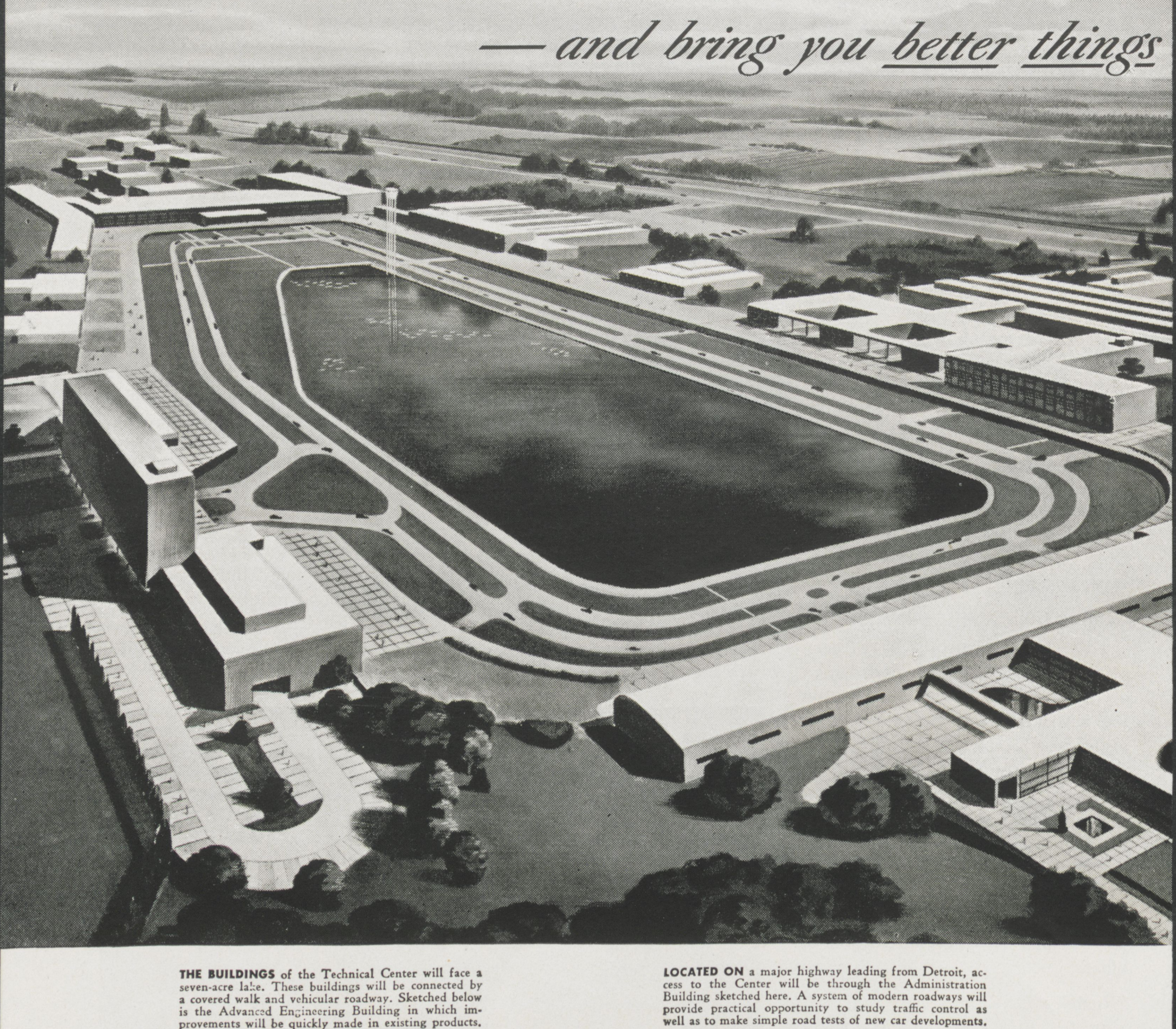
The Glee Club, with the addition of new Freshman members, should

(*Continued on Page* 31)

Liberation Day. *Photo by Durra*

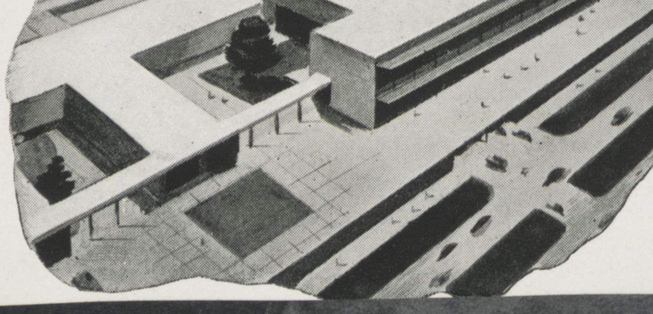
TO SPEED THE PACE OF

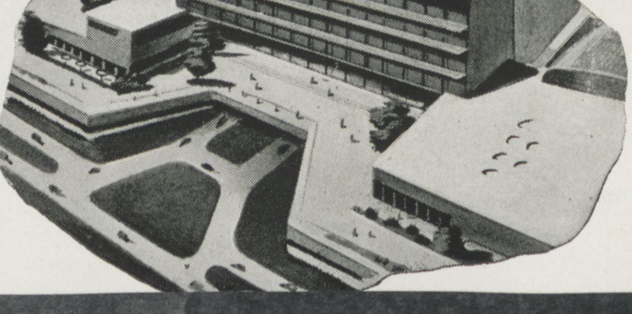
— and bring you better things



THE BUILDINGS of the Technical Center will face a seven-acre lake. These buildings will be connected by a covered walk and vehicular roadway. Sketched below is the Advanced Engineering Building in which improvements will be quickly made in existing products.

LOCATED ON a major highway leading from Detroit, access to the Center will be through the Administration Building sketched here. A system of modern roadways will provide practical opportunity to study traffic control as well as to make simple road tests of new car developments.





The New

GENERAL MOTORS TECHNICAL CENTER

will be created to stimulate opportunities, promote employment and bring about MORE and BETTER THINGS for MORE PEOPLE

THESE are times when the world cries out for new and finer things. There is a great hunger, broad as all mankind, for happier relationships among men — for greater individual opportunity for accomplishment, for more and better goods within reach of everyone.

It is by satisfying this hunger that we can bring greatest benefit to our national economy in the future. Through such action lies the road to more good jobs, to an ever-rising standard of living through the continual replacement of old things with new and better ones.

The General Motors Technical Center is dedicated to such an objective. It will occupy a 350-acre tract of land outside of Detroit as soon as conditions permit. Its purpose is to develop new things that add to the comfort and security of our living, and to enable existing things to be made more efficiently, hence at lower selling prices, so more people may own and enjoy them — all with expanding job opportunities.

It will shorten the time required to bring the work of creative thinkers out of the idea stage and into usable reality.

Here in groups of buildings designed especially for the purpose, General Motors will gather in advantageous and inspiring new surroundings the most modern facilities for research, advanced engineering, styling and the development of new manufacturing techniques.

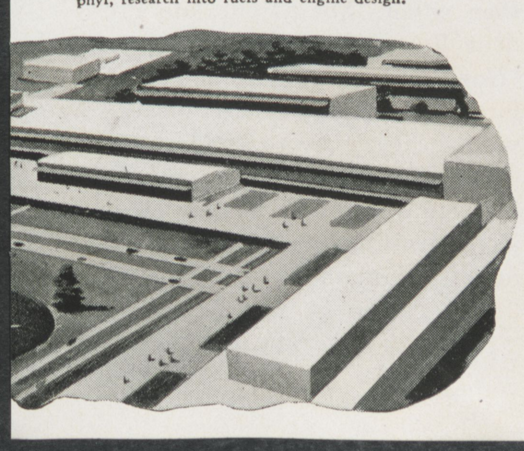
Here physicists and engineers will discover new facts and convert them into new improved products. Stylists will give them new and more attractive form. Process engineers will develop better manufacturing techniques for making them.

Science here will go to work in the interest of economic progress. And history is full of proof that when science is so harnessed, more jobs are created, more comforts and conveniences are brought within reach of more people.

Serving as a source on which the engineering staffs of all of our Divisions may draw, the General Motors Technical Center will stimulate improvement in all General Motors products. Automobiles, refrigerators, Diesel engines, locomotives and other good and useful things may be expected to be improved at even faster pace than in the past.

But the work of the Technical Center will not be confined to existing things. It is dedicated to the idea that progress is the servant of mankind and that whosoever advances it not only helps himself but his fellow men. Its goal will be "more and better things for more people," whether that comes through improvement of the old or development of the new.

A FLOOD OF SUNSHINE will pour into the southern windows of the Research Buildings where experimental work is carried on in such diverse fields as the study of chlorophyl, research into fuels and engine design.



GENERAL MOTORS

MORE AND BETTER THINGS FOR MORE PEOPLE

CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • CADILLAC • BODY BY FISHER
FRIGIDAIRE • GMC TRUCK AND COACH • GM DIESEL

Every Sunday Afternoon — GENERAL MOTORS SYMPHONY OF THE AIR — NBC Network

MAKE VICTORY COMPLETE—BUY MORE WAR BONDS

ELECTRICAL ENGINEERING

(*Continued from Page* 3)

cently has there been hardly any discussion of radar in current magazines at all. The subject was and still is carefully guarded by military authority. But it is no secret that radar will have a tremendous effect on the mass entertainment industries of the post war world.

Thousands of young men have attained a fair knowledge of electronics in war training programs. These trained men will certainly be able to find themselves a place in the engineering, marketing, and production of electronic devices.

Another development in the field of radio is that of frequency modulation. The advantages gained by FM broadcasting will probably revolutionize the radio industry from AM to FM as soon as possible following the war. At present there are about 210 applications filed with the Federal Communications Commission for FM broadcast transmitters. Also on file are about 60 television stations.

Smaller cities which heretofore found it impossible to have broadcast stations will be able to maintain local low powered FM stations. These stations are expected to have a major influence on business, social, religious, educational, and political activities and will broaden the outlook of life for people in smaller communities.

Because of the already overcrowded carrier spectrum in AM it was impossible to give every place that desired a broadcast station. But with FM there can be practically as many broadcast stations as there will be broadcasters to use them.

Television is confronted with many technical difficulties and work on them was stopped by the war. Even when these technical difficulties have been overcome television will have a great struggle with other fields of entertainment such as the stage and motion picture industries unless some special effort is made to prove television allies instead of enemies of these industries. Certainly television will come after the war, but it will take time just as the growth of other great industries has taken.

Rapid advances have taken place in aviation which have created many new problems for electrical engineers to solve. The major problem of aircraft designers is that of reliability, for lives depend upon this reliability. The life of airplane parts is therefore naturally shorter than for most industrial devices. Normally electrical devices are satisfactory if they will operate successfully for 1000 hours without attention.

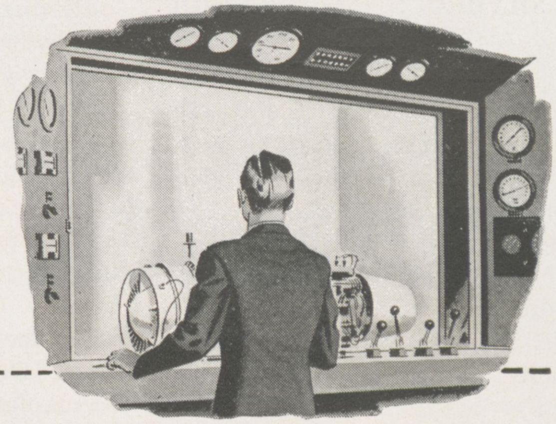
The weakest link in the electrical system is the motor. Under overload conditions they fail quickly and consequently precautions must be taken to prevent this.

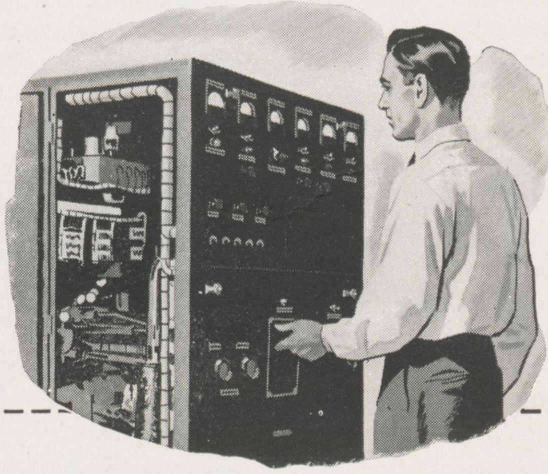
The problems facing the electrical engineer in aviation are many and difficult to solve but he must and will meet these problems. The electrical industries will not ask aviation to use equipment unless it equals or excells other types of equipment. To meet these problems there will be in the future an extensive program to educate aeronautical engineers in the proper use and applications of electrical equipment.

No engineer can afford to rest now merely because we are ahead. He is up to date on all matters of electricity and he must search out other opportunities and applications for his knowledge which are not now considered as being in his realm. The American public expects great things in the future and they will expect engineers to assume the responsibility of bringing them these new developments in peace just as they contributed so much in winning the war. We must not fail them then either. For as our late President Roosevelt said of the future, "New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life."

In a test cell an ENGINEER studies the performance of a jet-propulsion engine that is expected to produce greater thrust—*for its weight* —than any made in America.

. . . the name on the J-P ENGINE is Westinghouse.



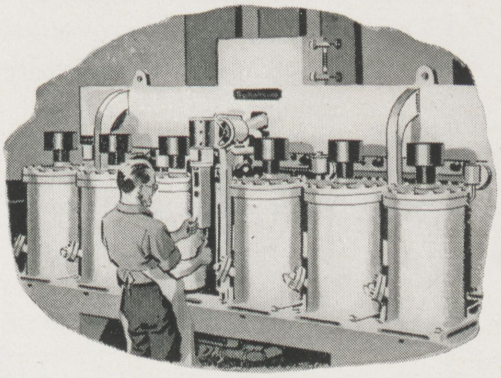


In a synthetic rubber plant a CHEMIST uses a mass spectrometer to analyze a complex gas mixture by sorting its molecules—reducing analyzing time from *days* to a matter of *minutes.*

. . . the name on the MASS SPECTROMETER is Westinghouse.

High in the air a SCIENTIST adjusts a fulchronograph which accurately records the *intensity* and *duration* of thunderbolts—in the never ending study of improved protection against lightning.

. . . the name on the FULCHRONOGRAPH is Westinghouse.



In a refining plant a METALLURGIST uses an Ignitron* rectifier for the more efficient conversion of alternating to direct current—in producing vast quantities of aluminum for our war effort.

. . . the name on the IGNITRON RECTIFIER is Westinghouse.

*Reg. U. S. Pat. Off.

Westinghouse
PLANTS IN 25 CITIES OFFICES EVERYWHERE

TODAY —Westinghouse war products are making vital contributions to final Victory over our enemies in the Far East.

TOMORROW—Peacetime products . . . backed by Westinghouse research, engineering and precision manufacture . . . will contribute to greater efficiency in industry and better living in our homes.

Tune in: JOHN CHARLES THOMAS—Sunday 2:30 pm, EWT, NBC • TED MALONE—Monday through Friday, 11:45 am, EWT, Blue Network

ANHYDROUS HYROFLUORIC ACID

(*Continued from Page* 5)

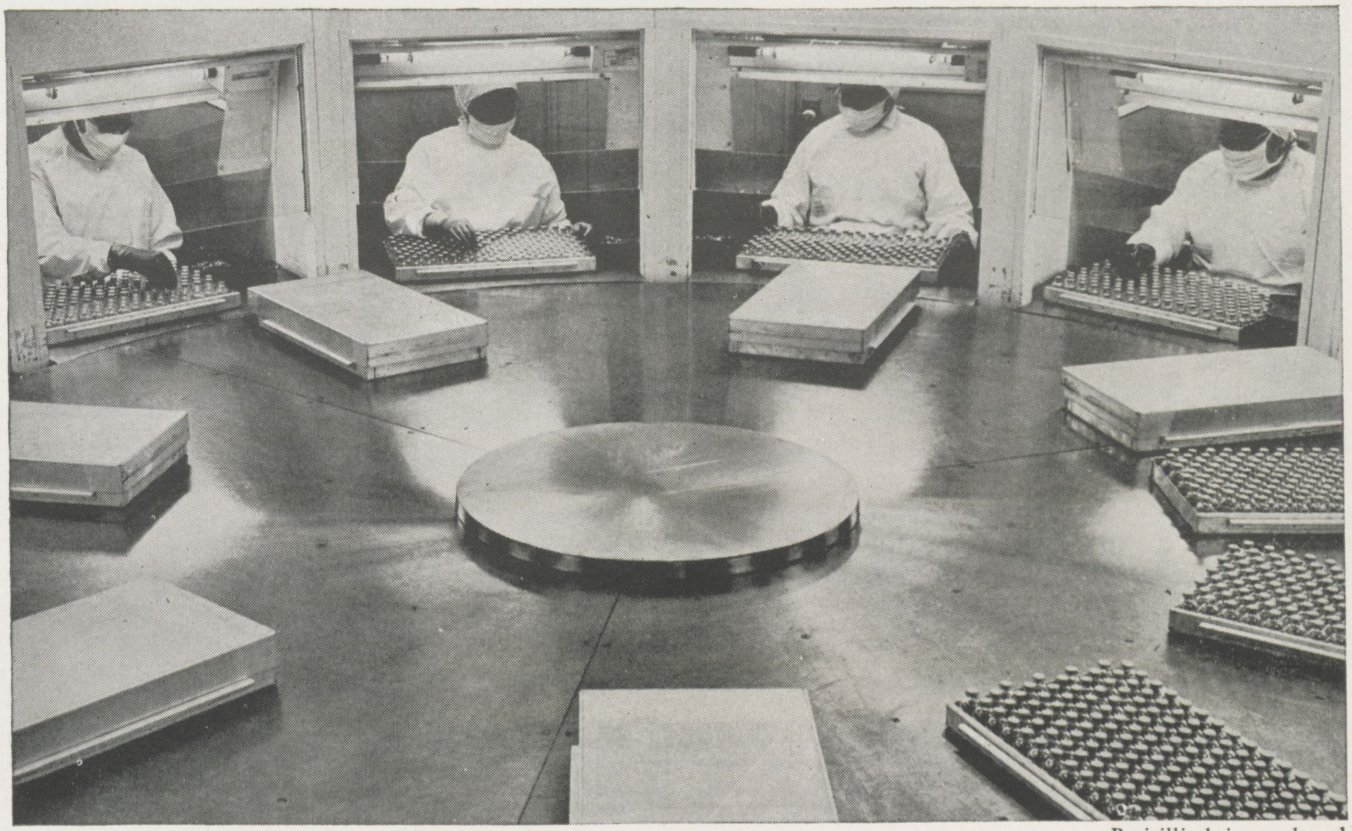
remove water, which would reduce the catalyst efficiency. The hydrocarbon stream is then introduced into the reactor unit in the liquid state, where it is agitated vigorously with an equal volume of AHF to produce an emulsion, making possible intimate contact of the reactants with the catalyst. A high ratio of isobutane to olefin is maintained to prevent polymerization of the olefins, a reaction also catalyzed by AHF. The alkylation reaction is usually allowed to proceed for about a half hour and is carried out at a temperature of 75° to 115°F, the heat of reaction being absorbed by the circulation of water through the cooling coils in the reactor. Pressures of 100 to 150 pounds per square inch are sufficient to keep both the acid and the reactants in the liquid state.

The effluent stream from the reactors is passed into a settling tank where the emulsion of AHF and the hydrocarbons separates into two layers. The small amount of physically dissolved HF is removed from the hydrocarbons in a fractionating tower, while organically combined fluorine is removed by treatment with bauxite or other substances. The effluent hydrocarbon stream from the treatment is passed through a fractionating system which removes isobutane, propane, and n-butane. The AHF and unreacted isobutane are recycled to the reactor. Organic fluorides and water accumulate slowly in the acid and must be removed when they begin to impair the efficiency of the catalyst. Under operating conditions the consumption of AHF averages about 1 to 1.5 lb. per barrel of alkylate. The alkylate has an ASTM octane rating of about 93. Fluorine content is usually 5 p.p.m. or less.

The use of AHF in the alkylation process presents certain major advantages over the use of the older catalyst, sulfuric acid. The regeneration of AHF is a feature of the new process, while the disposal of spent acid is sometimes a serious problem in the older process. Sulfuric acid produces tarry residues and other undesirable by-products, while this does not occur to a great extent with AHF. Another advantage of AHF over H_2SO_4 results from the fact that a high process temperature may be used with AHF. This permits cooling by means of water instead of the expensive refrigeration required in the lower-temperature H_2SO_4 process. Disadvantages of AHF include localized corrosion problems and the high cost of the catalyst. However, the fact that AHF can be used over and over again reduces the apparent wide disparity between its cost and that of H_2SO_4.

Other Catalytic Uses of AHF

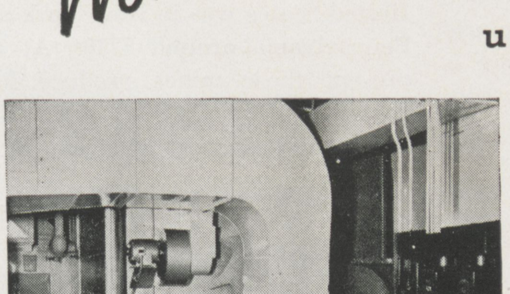
Although the most prominent uses for AHF at present are in the production of aviation alkylate and Freon, laboratory reports show that the acid has a bright future as a catalyst in many other organic reactions. Its chemical properties as a catalyst probably depend upon its great dehydrating power, high acidity, strong solvent properties, and its tendency to form molecular complexes with itself and other molecules. Hydrofluoric acid has been found to be an efficient catalyst for such general types of reactions as alkylation, polymerization, dehydration, and condensation. In certain cases the acid also enters directly into the reaction to bring about fluorination. This may be either a substitution reaction, such as the one producing Freon, or an addition reaction, such as the addition of an HF molecule to ethylene to produce ethyl fluoride. In almost all reactions highest efficiency is obtained with the use of absolutely anhydrous HF, although a considerable percentage of water is permissible in many cases.



Penicillin being packaged

World's Largest Producer of Penicillin

uses GAS for important operation



Penicillin drying unit

An example of the versatility of industrial Gas is seen in the plant of Chas. Pfizer & Co., Inc., Brooklyn, N.Y., which has the world's largest production of life-saving Penicillin. Gas is proud to have a part in this vital job.

In one of the important steps in the manufacture of Penicillin it is essential that the humidity be maintained below 10%, drier than the air of many deserts, for perfection in the finished product.

An industrial dehumidifying unit consisting of beds of moisture hungry activated alumina is used to reduce the moisture content. Clean Gas heat reactivates the alumina beds.

In such delicate and finely balanced processes even as in heavy industrial operations, Gas with its instant heat, automatic control and flexibility is the ideal fuel. Local Gas Companies help make these new benefits of Gas available to industry through the services of skilled Industrial Gas Engineers.

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INDUSTRIAL AND COMMERCIAL GAS SECTION
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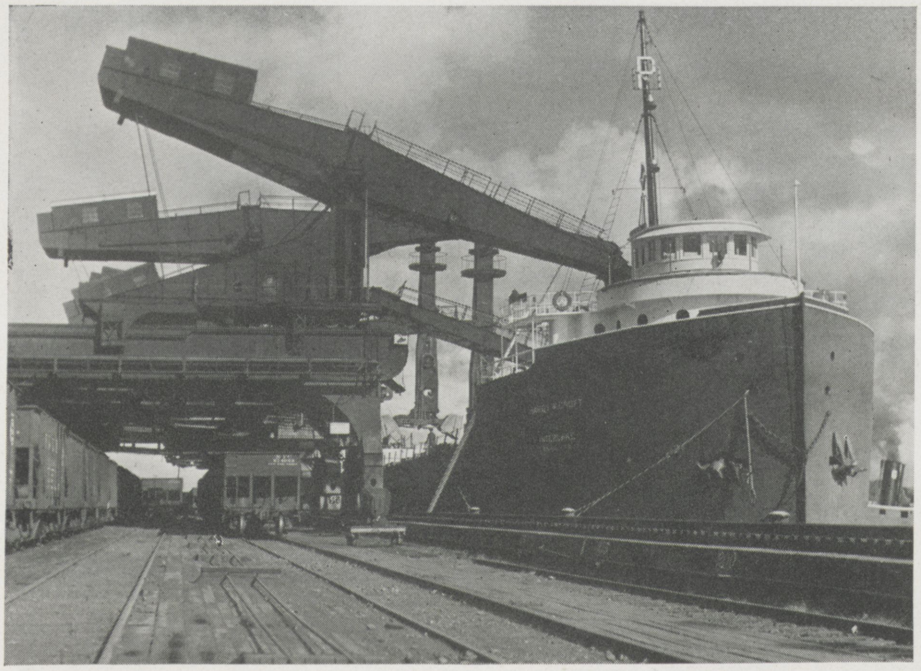

Westinghouse

At a Lake Erie port Hewlett unloaders quickly empty a boat of its iron ore.

IRON ORE

(*Continued from Page* 7)

the world the total of reserves is a matter of conjecture. The Minnesota tax commission in 1943 estimated the Mesabi reserves as 1060 million gross tons. It is generally conceded by those who know that the actual reserves could not be much more than this figure. Minnesota, unfortunately, commences taxation on an ore body as soon as it is discovered to be of value. Such a law naturally tends to oppose exploration of possible future supplies of ore. It can safely be said that more than half of the ore of the Mesabi is gone, and in terms of years much more than half since the rate of production has been greatly increased. At the rate the ore is being mined now it will be exhausted in ten years; however under normal conditions it might last thirty-five years.

The figures above deal with what is considered ore under present standards. It might be said that there are two other grades of iron ore. The "second" grade has an iron content of 35 to 50 percent. Such an ore, since is it found as a hard rock, demands expensive mining processes. The Mesabi alone contains an estimated billion tons of this ore. Beneficiation would be required to a great extent. However, it must be held in mind that this ore may be used with processes already developed without entirely prohibitive expense. Even now when such ore must be removed to uncover good ore, the inferior ore is concentrated and used. Such concentrated ore accounts for 22 percent of the total shipped annually from Minnesota.

The third grade of ore can hardly be considered at the present. It is mainly iron carbonate with large amounts of silica. This material is called taconite. Compared to other reserves it may be considered limitless. It is composed of 25 to 35 percent iron, and in the Lake Superior area it has no desirable impurity which would render it useful.

Although the Mesabi is the greatest ore producing area in the world, it is not the only one in the Lake Superior area. The Cuyuna, thirty miles southwest of the Mesabi, has produced a total of 53 million gross tons of 42 percent ore since it was opened. The Vermillion, the Gogebic, the Marquette, and the Menominee ranges have produced a total of 700 million tons of ore. They furnish one-fifth of the ore produced annually. These mines are principally underground operations.

In the United States the next in importance to the mines of the Lake Superior district are the underground mines around Birmingham, Alabama. Eight to twelve percent of the total annual production comes from these mines. The city of Birmingham stands on top of a tremendous underground ore reserve. It is estimated that this reserve amounts from one and one-half to two billion tons. This ore has a large silica content, and it is only 36 percent iron. However, it is considered an ore on account of the high lime content, 15.6 percent, which makes the ore self-fluxing to some extent. The Red Mountain ores in this district are mined in two important seams; one of which is 15 to 30 feet thick, and the other of which is 4 to 6 feet thick. These seams are over 20 miles long, running northeast and southwest. They are tilted eastward at angles of 15 to 30 degrees.

The earliest iron ore mining in United States was in New York and Pennsylvania around 1710. At the present these mines produce four percent of the national total. The ores are 45 percent iron, and since they are magnetite they are concentrated magnetically to high grade 60 percent ore.

Besides the blast furnaces in the Great Lakes area, the Northeast, and at Birmingham there are others scattered throughout the West. In Colorado, Utah, California, and Texas iron ore mining is carried on to a limited extent. These mines account for two percent of the total for the nation. There is an estimated one and one-half billion tons reserve in these areas (including the South outside of Birmingham); however its scattered location and low concentration leaves it out of the present picture. In the future its presence will become ever increasingly important.

(*Continued on Page* 24)

A VITAL PART OF YOUR TELEVISION SET WILL BE A VACUUM
...LITERALLY NOTHING!

THAT'S RIGHT...NOTHING. A blank, an absence of anything ...or, technically, a high vacuum...is all-important to television.

For a high vacuum in a television tube is necessary for control of the electrons that make television a reality.

The first step toward a high vacuum is pumping the air out of the tube. But pumping won't remove enough of it.

Here's where a "getter" of barium, one of the less common metals, comes in—and more air goes out of circulation. Inserted inside the television tube, the barium "getter" is *flashed* from the outside by electricity. Instantly it vaporizes and entraps the remaining air.*

Barium "getters" were developed by KEMET LABORATORIES COMPANY, INC., in their research on metals.

Contributions by this and other UCC Units to television and electronics do not stop here. Radio, radar, X-ray, hearing aids and other electronic devices have also benefited by the extensive research of UCC Units in the fields of alloys, carbons, chemicals, gases and plastics.

▼

**Barium has a high affinity for oxygen...and other gases. When the "getter" is flashed in television or radio tubes, molecules of hot metallic vapor combine with...and immobilize...remaining particles of air. The barium, with the "captured" air is deposited as a silvery film inside the tubes.*

Most UCC products...like barium "getters"...are basic raw materials for American industry. Just about every business enterprise, from the small corner garage to the largest steel plant, uses them in one form or another. If you want a description of these products and how they are used, write for the booklet P-9 "Products and Processes of UCC."

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IRON ORE

(*Continued from Page* 22)

There are several important sources of iron ore in foreign countries. Chile has large deposits of hematite of 60 percent iron. At one time United States imported 1500 million tons of this ore annually. There are great deposits in Brazil 350 miles from the Atlantic coast. Lack of transportation renders this ore useless at the present time. Another district in Brazil, southwest of the above, is the source of iron ore for the new Brazilian steel plant at Volta Redonda. Venezuela has deposits of very high grade iron ore.

Cuba has an estimated three billion tons of iron ore. Newfoundland is a potential source of four billion tons. Canada has 100 million tons of ore that can be used commercially. Just north of the Mesabi in Canada a lake was drained in order to mine the famous Steep Rock Lake deposit. This mine is the source of some 50 million tons. Labrador is being considered as a possible future source of ore.

In Europe, France's annual production is almost equal to that of United States. However, the potential reserves of France are insignificant when compared to those of United States. U. S. S. R. and Great Britain are third and fourth in the world standings as sources of ore.

As can be seen, the future supply of iron ore may well depend on the development of new beneficiation processes. Twelve companies are supporting a research program at Battelle Institute at Columbus, Ohio. Several workable beneficiation processes are now in use. Iron ore may be simply "washed" to remove particles of silica or sand grains. Magnetite ores are concentrated by crushing and then removing the iron ore particles by magnetic force. Since ferro-silicon has a density between that of iron oxide and silica, it acts as a separator in the "sink and float" process. In the flotation process the ore is placed in a mixture of water and any cheap oil. The water is adsorbed by the impurities and the oil by the ore. The oiled mineral is carried to the top by air bubbles coated with oil. The development of this process is accredited to the fact that a washerwoman noticed the phenomenon while washing an iron ore miner's clothes. The tremendous taconite reserves in Minnesota have prompted research to solve their beneficiation. The development of a concentration process for this ore would solve the iron ore problem for many years to come.

The United States has enormous potential reserves. The actual reserves of iron ore will probably be exhausted within thirty years. Scientific progress has promoted this exhaustion; it will remain for scientific progress to solve the problem it has created.

BASIC U. S INVENTIONS

(*Continued from Page* 10)

Edison's Incandescent Lamp 1880

Thomas A. Edison came from a family which up to his time had not displayed signs of exceptional ability. Edison, however, at the age of eleven already began accumulating apparatus for a chemical and physics laboratory at such rate that he found his allowance inadequate by the time he was fifteen. Then he persuaded his parents to let him sell newspapers on the Grand Trunk Railway between Port Huron and Detroit. After a disastrous fire in the baggage car started by one of his experiments, Edison was forcibly graduated from the newsboy job and became a telegraph operator. While still a very young man, he invented a multiple telegraphic stock ticker, on which he easily sold the patent for many times his estimate of its value. From then on his life work was set.

Edison had no formal technical training, but he did have close contact with current mechanical and electrical problems. One of Edison's first inventions was a voting machine which politicians did not want, which the public did not demand, and which was a flat failure. Thereafter, Edison surveyed the probable demand, the probable cost of development, and the probable profit before undertaking a project. Nevertheless, he lacked the kind of patience and skill required to run a manufacturing and selling organization, and he was totally uninterested in finance. Consequently, Edison personally received only a small fraction of the return obtainable from his various basic inventions, although the amounts received were enough for his needs and, more important to him, they maintained his well-equipped and well-staffed laboratory.

The incandescent filament lamp is the most important Edison invention and it well demonstrates his method of approach, which called for infinite care and great energy over long periods of time, and for courage in spending money on new ideas. Edison spent about $40,000 before he could produce the first incandescent lamp and he spent $100,000 in finding the best natural fiber for the filament. Electric arc lamps were well known, but they were not suitable for indoor use. The problem of "subdividing the electric light" was widely discussed and its answer had been sought by many persons before Edison supplied a practical solution.

Edison saw the problem as a possible boon to humanity, as a challenge to his ingenuity, and as a likely satisfactory supply for a large commercial demand. The nearest approach to an electric lamp was a device patented by Sawyer and Mann, in which a transparent evacuated bulb contained a thin U-shaped carbon rod connected to wires leading in from the exterior of the bulb. The Sawyer and Mann lamp was impractical because it used large amounts of current to produce only a feeble light and quickly burned out (52 F 300). Another claim to the lamp by Goebel was disproved in 54 F 678. Edison studied many different structures and made hundreds of tests before making the lamp shown in patent 233,898, issued January 27, 1880.

The main difficulty was finding a filament with enough resistance to operate satisfactorily from Edison's previously developed 110-volt dynamo. To be practical, the lamps had to be independent of each other, hence in parallel, and they had to use a high voltage and low current to keep down the size of the conductor. Edison knew that carbon had a high resistance and high melting point, and he believed that a thin, dense carbon filament would be best. He finally produced a carbonized thread 1/64 inch in diameter, compared to the Sawyer and Mann rod of 1/32 inch diameter.

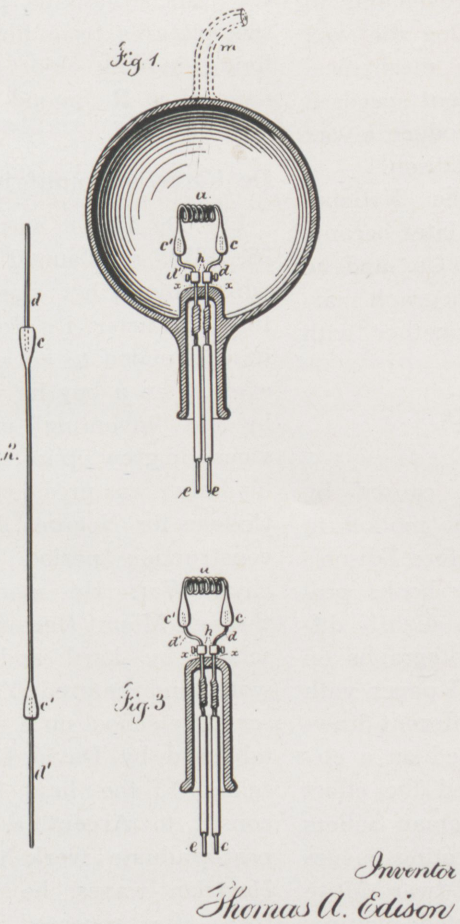
The results were remarkable, for the Edison lamp gave considerable light and burned for days before the filament broke. Edison had doubled the filament surface area and quadrupled the resistance. As a result, his lamp was eight times more efficient than the Sawyer and Mann lamp, and the electric industry was born.

Edison followed up the filament invention by making the bulb a one-piece sealed container to maintain the vacuum, by improving the lead-in wires and by providing a screw base. Newspaper reports of these developments caused such a drop in gas shares that a near panic on the London Stock Exchange occurred on October 11, 1878. Professor Henry Morton, then president of Stevens Institute of Technology, protested against the publicity given the incandescent lamp demonstrations because "everyone acquainted with the subject will recognize it as a conspicuous failure."

Lamps were first made at Edison's Menlo Park laboratory, but their manufacture soon required a separate factory. Consequently, the Edison Electric Light Co. was organized in October, 1878, with a capital of $300,000, and a factory was built a half mile from the laboratory. The lamp factory was moved to Harrison, N. J., in 1882. Sockets and other fixtures were made in New York by a separate organization, Bergmann & Co., after 1880. Dynamos were built in the Edison Machine Works in New York beginning in 1881. All of these companies became a part of the General Electric Co. and were the forerunners of Edison illuminating companies throughout the country. In two years over 150 installations of "60-lamp" dynamos were made, and the first central station was built at Pearl Street, New York, in September, 1882.

T. A. EDISON.
Electric-Lamp.

No. 223,898. Patented Jan. 27, 1880.

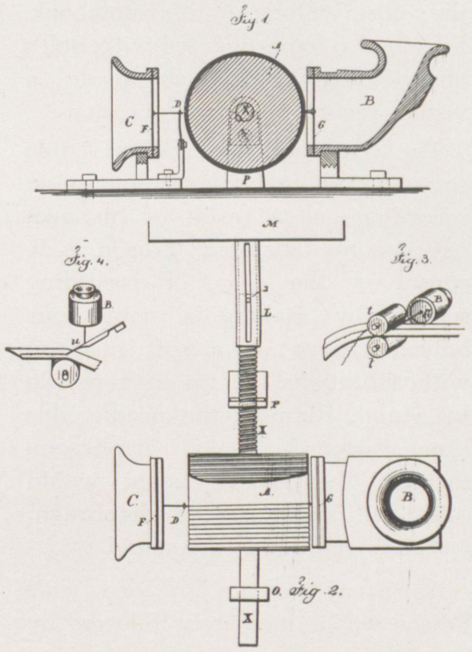


Allis Chalmers

Edison's incandescent lamp.

T. A. EDISON.
Phonograph or Speaking Machine.

No. 200,521. Patented Feb. 19, 1878.



Allis Chalmers

Edison's phonograph.

Edison's Phonograph 1878

Edison also invented two of the world's major amusement devices, the phonograph and the motion picture projector, either of which would be enough claim to fame for any average person.

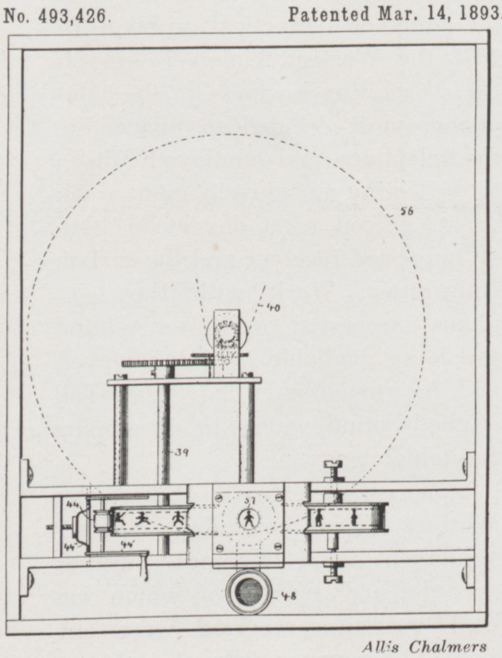
Development of the phonograph was not the result of haphazard experimentation, but a direct result of the study of a practical problem. In 1876 the Western Union Telegraph Co. was losing business to the telephone, so it decided to investigate the telephone and employed Edison to do testing and development work on it. Edison soon developed both an improved receiver and the carbon transmitter. Work with the telephone impressed on Edison's mind the force available in sound waves, and he remembered how Bell had studied sound waves in developing the telephone.

Other work done by Edison for Western Union included the development of a telegraph message recorder and repeater on which dot-dash messages received were embossed on a paper disk on one turntable, and relayed from the disk to a transmitting key on another turntable. He noticed that a musical note was produced when a disk was turned at high speed, so he recorded the observation in his notebook. Edison also experimented with Bell's phono-autograph, which made a visible record of sound vibrations.

The combination of Bell's visible sound graph and telegraphic sound recordings as a result of his own experiments inspired Edison. He conceived the idea of recording sounds by making a continuous helical groove on a soft material with vibrations set up in a needle by sound. Running the needle, this time fastened to a diaphragm, through the groove again would cause vibration of the diaphragm and thus reproduce the sound.

As usual, getting an idea with Edison was immediately followed by steps to produce a machine embodying the idea. Edison realized that he needed a lightweight surface large enough to move a recording point responsive to the air movements of sound. He tried a diaphragm and recording point on wax coated paper and got a fair response when he ran the paper back below the recording point. Edison had a model made so that he could use soft tinfoil,

T. A. EDISON.
APPARATUS FOR EXHIBITING PHOTOGRAPHS OF MOVING OBJECTS.
No. 493,426. Patented Mar. 14, 1893.



Allis Chalmers

Edison's motion picture projector.

which was more permanent than wax paper.

The day and night of the first test was a scene of almost delirious enthusiasm as the men took turns trying the new machine, for they still couldn't believe that sound could be recorded and reproduced! The instrument (patent 200,521, issued February 19, 1878) is an almost exact duplicate of the first phonograph, which was the basis for the entire phonograph industry.

Edison demonstrated the phonograph to the editor of the Scientific American, and the press immediately spread the discovery over the world. Everyone wanted to see, hear, and own one of the new machines. The first phonograph was used only for public demonstrations, and Boston alone in one week paid $1,800 in admissions to the demonstrations. Edison manufactured and sold the hand-operated, tinfoil cylinder record photographs for the nine years during which he was developing the incandescent lamp. Edison then turned to making improvements in the phonograph, including the wax cylinder record and a mechanical drive which gave constant speed. It took eight months to produce a wax record satisfactory to Edison.

Edison organized the National Phonograph Co., which later became the Edison Phonograph Co., and he participated in the phonograph market for many years together with his licensees.

Edison's Motion Picture Projector 1893

The optical illusion, caused by persistence of vision of motion in pictures, was known before Edison's time. For example, toy books produced this illusion with slightly different drawings or photographs on each page, and strips of paper with a sequence of slightly different drawings or pictures mounted on a circular frame also created the effect of motion. In 1861, Coleman Sellers patented a toy for projecting images in step-by-step motion. Edward Muybridge, in 1880, projected pictures at the rate of 12 and 32 per second to illustrate his lectures on animal movements. Friese-Greene, early in 1880, "exposed a negative on a traveling film 3,000 times in five minutes."

LePrince in 1886 filed a patent application proposing perforation of a film with a sprocket running in the perforations for positive film movement. However, it took Edison to determine that the speed of operation should be 16 frames per second for optical continuity in the pictures. He then proceeded to develop a film drive and shutter mechanism with which such speed could be maintained, together with a heat shielded incandescent lamp and lens system for projecting the pictures on a screen. The device was patented as No. 493,426 on March 14, 1893.

The motion picture projector was one example of an invention made before its time and without a serious attempt to introduce it to the public. As a result, it was not profitable to the inventor. The motion picture industry did not come into being until C. Francis Jenkins projected lifesize pictures from films taken of a living, moving object (a vaudeville dancer) at Richmond, Ind., on June 6, 1894.

De Forest's Amplifying Tube 1908

Lee De Forest was born August 26, 1873, at Council Bluffs, Iowa, where his father was a Congregational minister. De Forest was likewise intended to be a minister, but even when a boy he was fascinated by and "inventing" mechanical devices. He grew up in Alabama, where his father was president of Talladega College for Negroes during the reconstruction period following the Civil War. He managed to get through Mount Hermon preparatory school by hard and disagreeable work and entered Yale's Sheffield scientific school on a scholarship established by David De Forest (no relation), the first United States consul to Argentina. While doing post-graduate work in physics on Hertzian waves, he blew out the fuses after repeated warnings, and

(*Continued on Page* 28)

BASIC U. S. INVENTIONS

(*Continued from Page* 26)

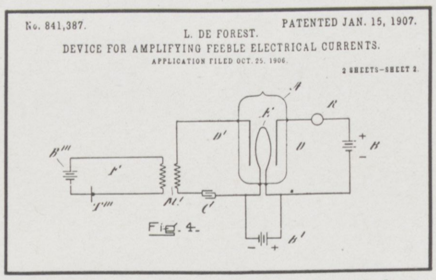
interrupted an important evening lecture. He was expelled from Sheffield school and finished his post-graduate work at Sloane Laboratory (Yale) in what was little more than advanced physics. The boyhood experiences in Alabama, his unusual appearance, his incessant day dreaming, poverty, and a well developed ego made him determined to acquire wealth and position. This became his driving force.

After receiving his Ph.D. degree, Dr. De Forest went to work in the Western Electric Co. laboratories, where he saw the iron filings coherer, in which the circuit was interrupted after each signal. He began work on a detector having a continuous circuit, which he developed in partnership with Edwin H. Smythe, who even helped him financially after De Forest was discharged from the laboratories. Test results of the new detector were unsatisfactory but promising enough to keep De Forest at work. He worked for the American Wireless Telegraph Co. of Milwaukee until pre-occupation with his detector again brought about his discharge.

Marconi's successful wireless transmission of signals fired De Forest's imagination, and he tried to put his new detector into use by organizing the De Forest Wireless Telegraph Co. in 1901. Stocks were sold, but no practical installations were made, and only law suits of various kinds resulted.

De Forest tried to set up a wireless telegraph system of five stations for the U. S. Navy, which resented Marconi's policy of only leasing equipment, but the record static in the year 1905 made the system unsatisfactory and interrupted the work. During his work for the Navy, De Forest had tried to improve the Fleming diode detecting tube (patent 803,684, issued November 7, 1905) as a way out of litigation with Marconi and Fessenden, and to save the one-half of the current "leaking" from the filament to the plate. In one of a large number of experiments he inserted a third electrode in various positions, and he finally placed a grid between the filament and plate, thus producing the audion on which he filed a patent application, after weeks of effort to raise the then $15.00 filing fee. The patent on the three-electrode tube was issued February 18, 1908, No. 879,532.

At that time the affairs of the De Forest Wireless Co. were so involved financially and otherwise that De Forest withdrew his then-pending application on the audion. He organized the Radio Telephone Co. and made various efforts to find uses for his tube. He even made broadcasts, including some from the Metropolitan Opera House in 1910.



Allis Chalmers

DeForest amplifying tube.

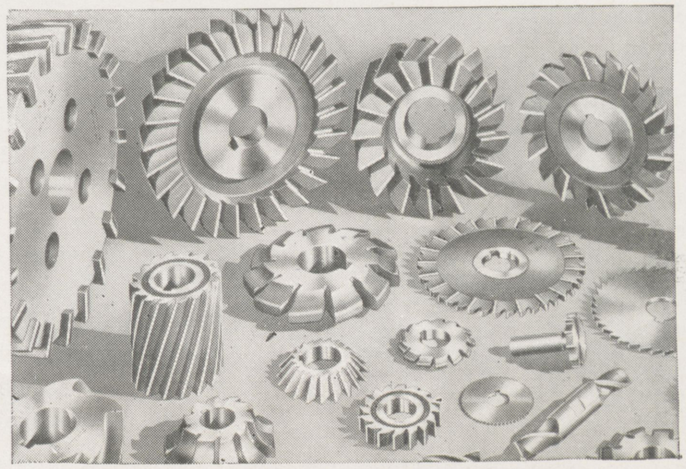
He exhibited his experimental apparatus before five engineers of the Western Electric Co. but received no response for months. Bankers refused him loans, and his Yale classmates would venture a total of only $500. As late as November, 1913, De Forest was tried for using the mails to defraud by offering stock, as charged, "in a company incorporated for $2,000,000 whose only assets are the De Forest patents, chiefly directed to a strange device like an incandescent lamp, which he calls an audion, and which device has proved to be worthless." The jury debated for 13 hours before reaching a verdict of acquittal.

De Forest then took a job with the Federal Telegraph Co., where he worked on the problem of amplifying signals. Here, for the first time, he connected several of his tubes in series to get amplification. At that time long distance telephony was impossible, and De Forest took his tube and circuit to A. T. & T. Co., where its possibilities were recognized. De Forest's dealings with a series of promoters and promotional companies had, however, so clouded the title to his invention that several months of work were required before rights under the tube patent could be sold to A. T. & T. by his Radio Telephone Co. for $250,000, of which De Forest's share was $175,000. Additional rights were later purchased by A. T. & T. for $90,000, and the transatlantic telephone became a reality in 1915.

Later A. T. & T. bought all of De Forest's patents and his vacuum tube inventions for a period of seven years. The purchase price which De Forest received was $250,000 and the right to manufacture equipment for amateur use and "for the distribution of music and news." De Forest had, however, also retained the right to license use of the audion to the Marconi Co. and he sold a license at a royalty of 80 cents per tube which brought him $160,000. However, that license became worthless when R. C. A. was formed with rights from A. T. & T.

De Forest admits that he has received four fortunes to date. But in 1913 he pawned his watch and his wife's ring for money with which to work on synchronizing speech with moving pictures. He succeeded in his talking movie work in 1923 (5 Journal of the Patent Office Society 270), but Hollywood was not interested, and four years later Fox bought the Case system for $1,500,000.

In 1914 De Forest lost his European patents for lack of $125 for renewal fees. In 1936 he went through bankruptcy, listing $104,000 of debts and $400 in assets. De Forest has received several honorary degrees, various medals, and numerous other tributes. He has approximately 175 patented inventions to his credit, but he makes a very modest living from the manufacture of diathermy machines under licenses from owners of other patents.



Mammoth Equipment for Indiana Mine

Some of the most powerful electric equipment ever designed for mining purposes is being manufactured for the Maumee Collieries Company's new open pit coal mine near Jasonville, Ind. When completed, it will be installed in one of the world's largest mining machines, a 25-cubic-yard dragline. According to engineers, this dragline will be so mammoth that, if it were placed atop a 12-story building, it could dig at ground level and could pick up in one scoop a load that would fill a freight car.

Weight of the huge mining machine will be 2,410,000 pounds. In operation it will be able to step off seven and a half feet at one stride, zig-zag between working locations, sidestep at any angle and travel over soft and irregular ground. Direction may be changed simply by swinging the machine's revolving frame. Without advancing its base it will be able to dump a load a block away.

Totalling the equivalent of approximately 700 horsepower, the electric equipment under construction includes the latest type of amplidyne control, as well as two large motor-generator sets. Installed, it will make possible open-cut mining at the unusual depth of 40 to 70 feet.

Open-pit operations at the Indiana mine employing the machine are expected to begin about September 1, according to Hugh B. Lee, vice president and general manager of Maumee Collieries Company. To be known as the Linton mine, number 28, it will have a monthly capacity of 60,000 tons of bituminous coal.

Kodiak, the Eskimo, was sitting on a cake of ice telling a story. He finished and got up.

"My tale is told," he said.

A railway superintendent received the following note from a foreman:

"I am making out an accident report about Casey hitting his foot with a sledge hammer. Under "remarks" do you want Casey's or mine?"

Prof.: "What's the difference between a good girl and a bad girl?"

Soph.: "A good girl gets up in the morning and says, 'Good morning, God.' A bad girl gets up in the morning and says, 'Good God, morning!' "

As the man in the hospital said when someone knocked on the door: "Who goes there, friend or enema?"

"Was your friend shocked over the death of his mother-in-law?"

"Shocked; he was electrocuted."

Clerk: "Here's a pretty card with a lovely sentiment: 'To the only girl I ever loved.' "

Waldbieser: "That's fine. Give me a dozen."

Prof.: "You boys of today want to make too much money. Why, do you know what I was getting when I got married?"

Voice from rear: "No, and I'll bet you didn't either."

A Scotchman was taking his small son for a walk. Suddenly he said thoughtfully, "Sandy, have you got your Sunday boots on?"

"Aye, father," was the reply.

"Well then, take longer steps."

This column is dedicated to Phillip.
Phillip who?
Why, Phillip space, of course.

CAMPUS SURVEY

(*Continued from Page* 15)

start back on the path to its pre-war achievements in the not-so-far future.

The Glee Club at present is composed of Sutton, president; Lawrence, Business Manager; Monzel, Schwier, Schuman, Ave, Templeton, Loring, Brown, Blickwedel, Ragsdale, Layer, Hanley, Stutz, Dodson, and Glavey.

Rifle Club

The Rifle Club will start to function again in the near future. At the present time the shortage of ammunition still handicaps this club. An organization meeting was held and the Freshmen, upon whom most of the clubs are depending, showed interest.

The club president is William Waldbieser.

Intramurals

Intramural softball, under the direction of Coach Phil Brown, has been the chief form of recreation around the school for the past two months.

The upperclassmen and the Freshmen have had some heated battles and the series ended with about an even number of wins for each club.

Intramural sports will remain in the vogue at Rose until such time as varsity athletics again come back to the campus.

New Freshman Class

Since the end of the war, numerous applications for admission to the school have been received from both civilians and returning veterans by the front office. Although it was originally stated that there would be no new class entering in the fall term, plans are now being made for a class at that time.

The ordinary dates of entry since the accelerated war-time program have been January and July. Only because of pressing requests has this exception been made.

No estimate of the number in the new class has been made, but a large number of letters are now in the mail.

Theta Xi

Kappa chapter held formal initiation for David Templeton of Sullivan, Indiana, on June 11, 1945.

Election of officers for the coming term was held June 18. Those elected were as follows: Herbert Bailey, president; Joseph Durra, vice-president; William Dedert, treasurer; Robert Penno, house manager; Brice Rumble, assistant house manager; David Templeton, corresponding secretary. Meetings were then disbanded till the new term.

On July 10, the newly elected officers were installed. A stag party was held on July 14, in honor of Albert Silverman of Evansville, Indiana, who was to leave for the Naval Training Base at Chicago, Illinois, on July 16.

Brother Eddie Booth visited the chapter on July 17. Most of the members went bowling with Eddie and had a very enjoyable time. Brother Booth is a 2nd Lieutenant in the Army Air Corps.

Brother Booth's visit was followed by a visit from Brother William Brown, who is a member of the Infantry. The chapter hopes to hear from them again soon.

Several members journeyed to Indianapolis on the week-end of August 3rd in acceptance of an invitation to Brother Robert Penno's home. As has been the case many times before, the brothers enjoyed their visit heartily.

A tour of Turkey Run State Park was undertaken by the brothers on the week-end of August 10th. A square dance was attended and they had quite a bit of fun doing the quaint steps involved.

The end of the war was celebrated with the general touch of hysteria and then studies were taken up again.

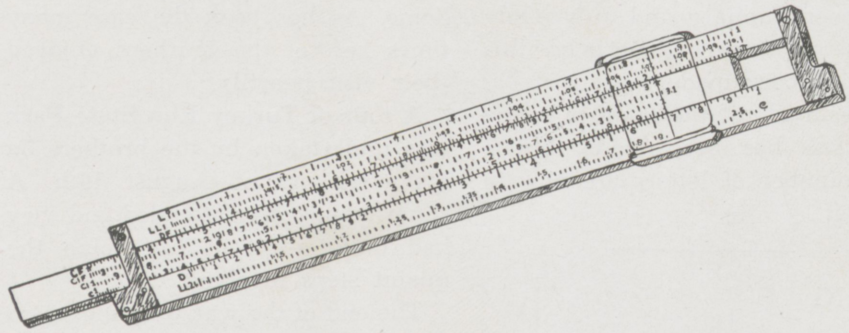
Evansville was the main center of activity during the week-end of August 17th. Brother Robert Kays and his wife were hosts and the visiting brothers spent an enjoyable time at his home.

Lambda Chi Alpha

The chapter has had several visitors recently. They are: Brothers William Mitchell, James Fields, Robert Kylander, John Mitchell, and Robert Greger. John has seen service with the army in Europe, and Jim, a member of the Army Air Corps, was for sixteen months a prisoner of the Germans after being shot down over France. Jim expects to return to school in the next few months. The other three are all navy men. Kylander is taking the Navy Radio Technician training at Navy Pier, and Greger has just completed the same course at Treasurer Island, San Francisco.

Sly Droolings

by Don Ingle, freshman



"Papa," queried the son, "what is the person called who brings you in contact with the spirit-world?"

"A bartender, my son," replied the father.

Joe: "I want to change my name, your honor."

Judge: "What is your name?"

Joe: "Joe Stinx."

Judge: "I don't bame you. What do you want to change it to?"

Joe: "Charlie."

We aways called a spade a spade until we hit our foot with one yesterday.

Mrs. Brown: "Whenever I'm in the dumps, I get myself a new hat."

Mrs. Jones: "I was wondering where you got them."

Did you make the debating team?

N-n-no. They s-s-said I w-w-wasn't t-t-tall enough.

Coed in local store: "I want a new corset."

Clerk: "What bust?"

Coed: "Oh nothing, it just wore out."

Visitors always make us happy; some when they come and the others when they go.

"Are you a college man?"

"No, a horse stepped on my hat."

Prof. (Chemistry): "Name the three states in which water may exist."

Ch. E. "New York, New Jersey, and Pennsylvania."

Westinghouse

"Henry simply can't do a thing without his slide rule."

The following is allegedly a report found on a captured Japanese spy: "Dear Hon. Emporer, Have thoroughly investigated Washington for prospect of bombing she. Have honorable duty to report it are useless. Dastardly American government have taken audacity to be very forehanded. If Hon. Japanese fliers destroy one building with all its occupants it are accomplishing absolute nility. For there are two other buildings completely staffed with Americans doing exactly same thing."

An unobtrusive gentleman in the museum was gazing rapturously at a huge oil painting of a shapely girl dressed only in a few strategically arranged leaves. The title of the picture was "Spring." Suddenly the voice of his wife snapped, "Well, what are you waiting for—Autumn?"

"Waiter, bring us each an order of Tortoni Sponginelli, please."

"I'ma sorry I no can do, gentlemens. You see, dotsa da proprietor."

"To a young man named Cholmondeley Colquhoun
Who kept as a pet a babolquhoun,
His mother said: "Cholmondeley,
Do you think it quite colmondeley
to feed your babolquhoun with a spolquhoun?"

Baby Ear of Corn: "Mummy, where did I tum fum?"

Mummy Ear of Corn: "The stalk brought you, dear."

"William get your Father's hat out of the mudpuddle."

"I can't, maw, he's got it strapped under his chin."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